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A STUDY OF EXECUTIVE INFORMATION REQUIREMENTS WITHIN A NAVY CONSTRUCTION CONTRACTING ORGANIZATION

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A STUDY OF EXECUTIVE INFORMATION REQUIREMENTS WITHIN A NAVY CONSTRUCTION CONTRACTING ORGANIZATION

by

Richard Curtis Johnson

December 1974

Thesis Advisor: J. K. Hartman

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A Study of Executive Information Requirements within a Navy Construction Contracting Organization

by

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Submitted in partial fulfillment of the
requirements for the degree of

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I. INTRODUCTION

The military construction function of the U. S. Navy is tasked to the Naval Facilities Engineering Command (NAVFAC). Within the NAVFAC organization, the actual planning, engineering, design and construction of facilities is performed by six Engineering Field Divisions which are among the primary NAVFAC field activities. Within an Engineering Field Division (EFD), the work of engineering, design and construction is tasked to the Acquisition Department. The design function is performed primarily through contracts with private Architect-Engineer firms, although the department does have an in-house design capability. The construction function is performed through competitively bid contracts with private construction companies. The primary work of the Acquisition Department, therefore, is contract preparation and administration.

This thesis is a study of the information requirements of the Acquisition Department Head. There are currently six Acquisition Department Heads, one in each Engineering Field Division, and all of them are Navy Civil Engineer Corps officers of the rank of Commander. As an executive in charge of a contracting organization that employs from 230 to over 500 personnel and that accomplishes an annual completed construction volume of from $75 to $200 million,

each Acquisition Department Head has strategic and tactical information requirements which are unique to the individual due to differences in management style, organization and current problems. There is, however, a body of information that is common to the requirements of all the Acquisition Department Heads. The problem addressed by this thesis is to identify these Acquisition Department Head mutual information requirements, to identify how the requirements are currently being met and to suggest improvements to the information systems providing the information.

The thesis begins with a background section to provide the reader with a brief description of how the U. S. Navy is organized to accomplish facilities acquisition, including a description of Naval Facilities Engineering Command and the Engineering Field Divisions. The functions of the Acquisition Department are described in some detail and tasks of the Acquisition Department Head and his key staff members are discussed.

Following the presentation of essential background information, the investigational procedures employed in the thesis research are described. The vast majority of the data was obtained through interviews with the Acquisition Department Heads and their key staff members. The interview formats used and the interview objectives are described. Other data was obtained through interviews with officials in NAVFAC and in the NAVFAC automated data processing organization, Facilities Systems Office.

The list of key persons interviewed is included in Appendix A. The remainder of the data and background information was obtained from review of the various manuals, publications, instructions and documents listed in the bibliography.

After the explanation of the investigational procedures in Section III, the results of the investigation are described and discussed in Section IV. A summary of the information requirements that are mutual to all of the Acquisition Department Heads is presented, followed by a description of the information systems that are currently available to provide this information. How the Acquisition Department Heads actually use the available information systems in the performance of their duties is discussed, and some significant observations of the current uses are highlighted.

Based on the significant observations made in Section IV, an argument for the increased emphasis of automated reporting systems over non-automated reporting systems is presented in Section V. The necessity of performing additional system and operational analysis in the development of new automated reports is pointed out. Several changes to the data structure of the current automated systems are recommended to increase the potential of these systems to produce executive level management information. Three automated reports aimed at the specific information needs of the Acquisition Department Heads are proposed in Section V and several other potential sources of management information are discussed.

This thesis is an application of the management principles learned by the writer as a student at the Naval Postgraduate School to a "real world" problem in the area of his professional interest. In addition to benefitting himself by gaining a deeper understanding of a system in which a significant portion of his professional career will be spent, the writer has intended to benefit the system by making suggestions which could improve the management techniques and information flow within the system. Several significant observations have been made in this thesis. To the writer, perhaps the most significant of them all is the value of the opportunity to work on an operational problem without the press of operational commitments.

II. BACKGROUND

A. THE UNITED STATES NAVY

The United States Navy is currently structured into two broad organizational divisions, the operational forces and the logistic support forces, both under the direct control of the Chief of Naval Operations. Heading the logistic support organizations are the Chief of Naval Material, the Chief of Naval Personnel and the Chief, Bureau of Medicine and Surgery.

Included in the organization of the Naval Material Command are six principal subordinate commands, known as the "systems commands", which are:

The Naval Air Systems Command
The Naval Electronic Systems Command
The Naval Facilities Engineering Command
The Naval Ordnance Systems Command
The Naval Ship Systems Command
The Naval Supply Systems Command

The system command tasked with the planning, programming, design, construction and support of Navy public works facilities is the Naval Facilities Engineering Command. [Reference 1.]

B. THE NAVAL FACILITIES ENGINEERING COMMAND

The Naval Facilities Engineering Command (NAVFAC) provides support to the operational forces of the Navy, the Marine Corps, other components of the Naval Material Command, and other offices and organizations in regard to shore facilities and related engineering, material and equipment. NAVFAC has been tasked by the U. S. Congress as one of the primary agencies for the contracting of construction funded by Military Construction appropriations. [Reference 2.]

The mission operations of the Naval Facilities Engineering Command are directed from a headquarters office located in Alexandria, Virginia (Washington D.C. area) and are executed through the NAVFAC primary field activities. These primary field activities include Engineering Field Divisions, Public Works Centers and Construction Battalion Centers.

NAVFAC manages its mission responsibilities through a series of mission subdivisions called programs. The purpose of management by programs is to concentrate attention, capability and resources on each area of mission responsibility and to provide an orderly means of establishing priorities, allocating resources and evaluating performance. The program structure as a management tool facilitates goal assignment, budget assessment and allocation, responsibility assignment, and progress and efficiency evaluation.

The management programs by which NAVFAC performs its mission responsibilities are:

I. Research
II. Planning and Real Estate
III. Engineering
IV. Construction
V. Military Construction Programming
VI. Seabees
VII. (Vacant)
VIII. Family Housing
IX. Public Works
X. Administration

The NAVFAC programs directly relating to construction contracting and this thesis are Program III, Engineering, and Program IV, Construction. As described in Reference 3, the Engineering Program provides cost effective facilities engineering solutions to the functional/operational requirements of the Navy. This includes management and accomplishment of engineering and design of facilities, engineering consultation, value engineering and technical training of engineering/architectural staff. The Construction Program provides administrative, contractual and technical services in the execution of the Navy Construction Program, and similar services in the execution of construction projects for other agencies, in order that timely facilities combining high quality construction at minimum cost are realized.

Although other NAVFAC organizations are involved, the Engineering and Construction programs are executed primarily by NAVFAC Headquarters and by the Engineering Field Divisions.

C. THE ENGINEERING FIELD DIVISIONS

The NAVFAC Engineering Field Divisions (EFDs) are similar to NAVFAC Headquarters in both organizational structure and operational programs. There are currently six Engineering Field Divisions which are decentralized to broad geographical areas of responsibility. The six EFDs and their command locations are:

EFD		LOCATION
Northern Division	(NORTHDIV)	Philadelphia, Pennsylvania
Chesapeake Division	(CHESDIV)	Washington, D.C.
Atlantic Division	(LANTDIV)	Norfolk, Virginia
Southern Division	(SOUTHDIV)	Charleston, South Carolina
Western Division	(WESTDIV)	San Bruno, California
Pacific Division	(PACDIV)	Pearl Harbor, Hawaii

The geographic responsibility for the continental United States and Alaska is divided among NORTHDIV, CHESDIV, SOUTHDIV, WESTDIV, and part of LANTDIV. Hawaii and the Pacific area, including Asia is assigned to PACDIV. The Atlantic area, including Europe is assigned to LANTDIV.

The organization chart for a typical EFD is presented in Figure 1. The organization structure of the line departments reflects the three primary functions of the EFD, facilities acquisition, facilities management and facilities planning.

ENGINEERING FIELD DIVISION ORGANIZATION

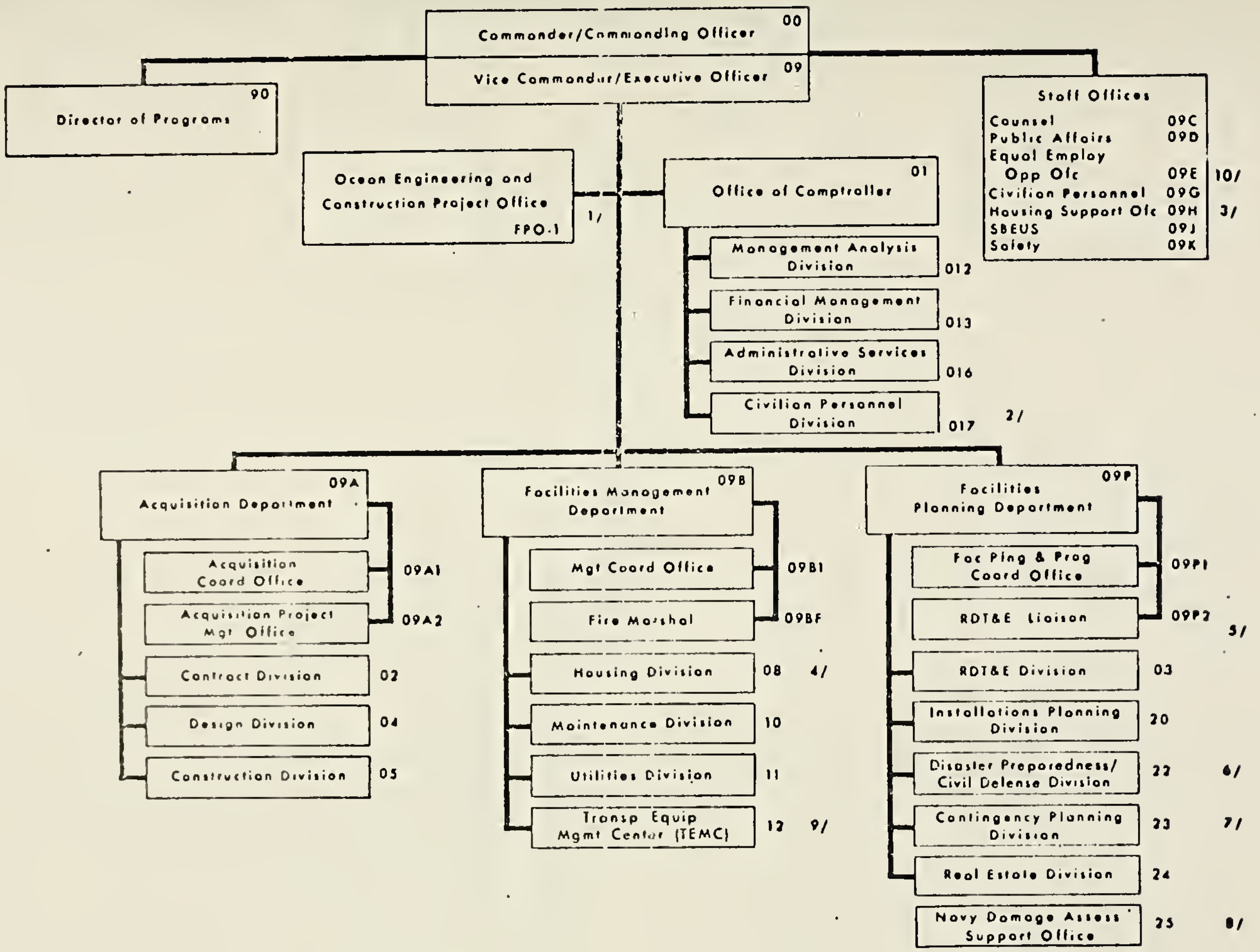
Commander/Commanding Officer 00
Vice Commander/Executive Officer 09
Director of Programs 90
Ocean Engineering and Construction Project Office FPO-1 1/
Office of Comptroller 01
Management Analysis Division 012
Financial Management Division 013
Administrative Services Division 016
Civilian Personnel Division 017 2/
Staff Offices
Counsel 09C
Public Affairs 09D
Equal Employ Opp Ofc 09E 10/
Civilian Personnel 09G
Housing Support Ofc 09H 3/
SBEUS 09J
Safety 09K
Acquisition Department 09A
Acquisition Coord Office 09A1
Acquisition Project Mgt Office 09A2
Contract Division 02
Design Division 04
Construction Division 05
Facilities Management Department 09B
Mgt Coord Office 09B1
Fire Marshal 09BF
Housing Division 08 4/
Maintenance Division 10
Utilities Division 11
Transp Equip Mgmt Center (TEMC) 12 9/
Facilities Planning Department 09P
Fac Plng & Prog Coord Office 09P1
RDT&E Liaison 09P2 5/
RDT&E Division 03
Installations Planning Division 20
Disaster Preparedness/ Civil Defense Division 22 6/
Contingency Planning Division 23 7/
Real Estate Division 24
Navy Damage Assess Support Office 25 8/

FIGURE 1

The Acquisition Department is responsible for the facilities acquisition tasks of engineering, design, construction and contracting. The Facilities Management Department is responsible for the public works management of housing, maintenance, utilities and transportation. The Facilities Planning Department performs in the areas of real estate, shore installations and facilities planning and programming, military readiness, advance base development planning, civil defense and research and development. [Reference 4.]

As this thesis is confined to the information requirements and systems within the Acquisition Department only, no further discussion of the other line departments of an EFD will be made.

D. THE ACQUISITION DEPARTMENT

As previously discussed, the primary responsibilities of the Acquisition Department of an Engineering Field Division include the facilities acquisition functions of engineering, design, construction and contracts. As shown in Figure 2, the Department utilizes a divisional structure to perform its tasks. The primary divisions include the Acquisition Coordination Office, the Acquisition Project Management Office, the Contracts Division, the Design Division and the Construction Division.

The Acquisition Department is the conduit through which construction projects are designed and executed.

TYPICAL ACQUISITION DEPARTMENT ORGANIZATION CHART

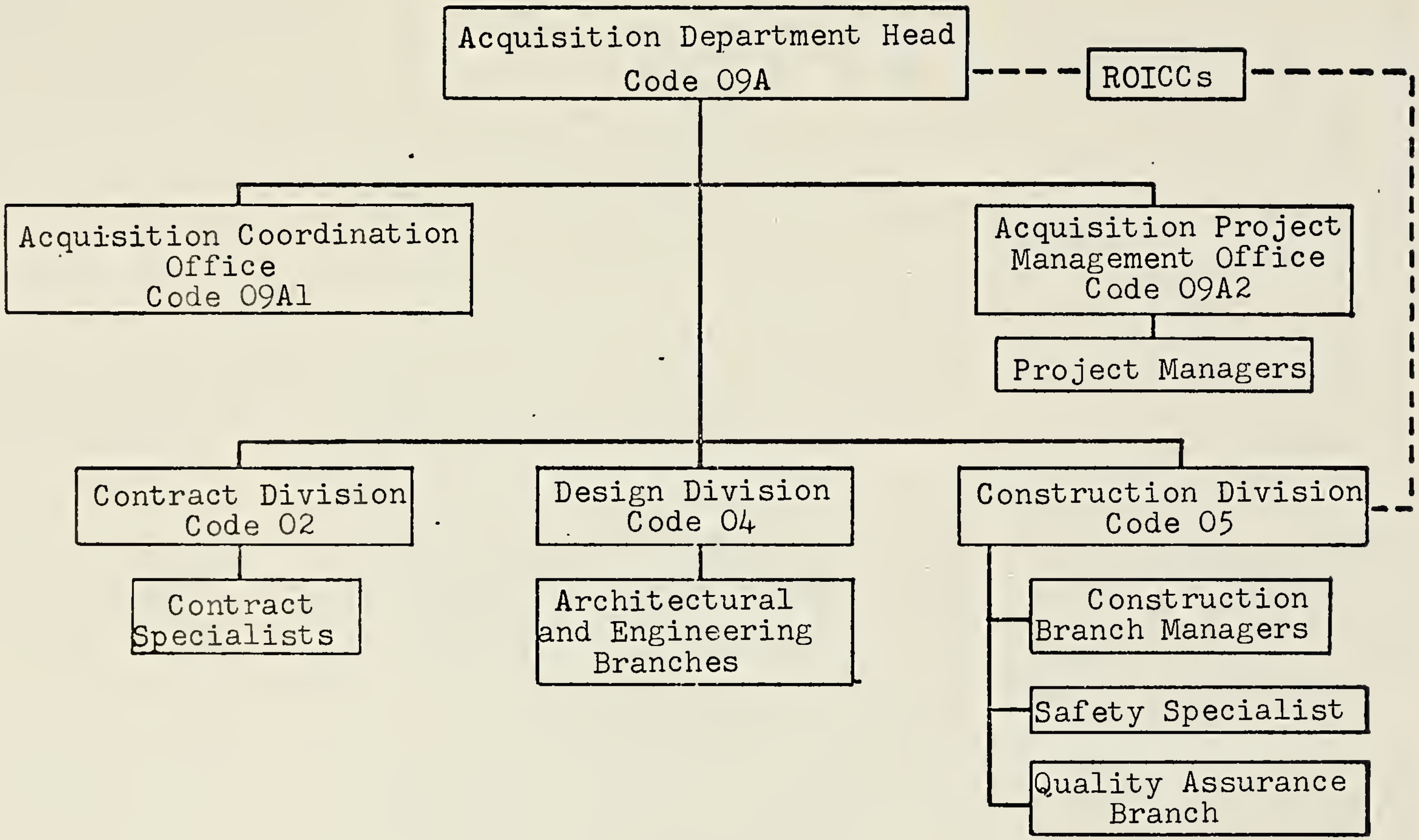

FIGURE 2

The Design Division performs the function of designing facilities to be constructed and preparing the plans and specifications required for the construction. The Contracts Division assembles the plans and specifications into a construction contract bid package, advertises the package for competative bid by private construction firms, awards the contract to the lowest responsive, responsible bidder, and maintains the contract documents throughout its execution. The Construction Division, through its field offices, assures compliance of the construction contractor to the terms of the contract. It assures that the construction is in accordance with the plans and specifications and is of the quality contracted for. The Project Management Office monitors the progress of each project through the entire process from pre-design planning through closeout of the construction contract and turnover of the completed facility to the user. It assures that all essential steps of the process are completed, that steady progress is maintained, that allotted funds for each individual project are not exceeded, and that all other constraints are not violated.

The input to this "pipeline" are the various types of construction funding and authorization and the needs of the eventual users of the facilities to be constructed. The largest source of construction funds and authorization that the Acquisition Department receives is from the annual Military Construction Authorization and Appropriation Acts approved by Congress.

It is through these Acts that the EFDs are assigned the fund and scope limitations for the largest portion of their projects. The task of the Acquisition Department, working within the constraints of available funds and authorized scope, is to best meet the needs of the user in terms of a completed facility. The output of the Acquisition Department pipeline is the completed facility which has been turned over to the user activity and which fits within money, scope and user needs constraints.

In addition to completed construction, another output of the Acquisition Department is Supervision, Inspection and Overhead (SIOH) funds. This is, in essence, the fee that the EFD and NAVFAC receive for designing and executing the construction projects and is part of the cost of the project charged against the funding source. SIOH fees are determined as a percentage of the project cost. Currently, SIOH fees vary from a maximum of 6% of the project current working estimate (CWE) to a minimum of 3% of the CWE. Projects for the new construction of family housing and trailer parks and some improvement-type projects are charged 3½%. Civil Works projects for which only contract administration services are supplied are charged 3%. Projects funded by Navy Operations and Maintainance cites do not earn SIOH because NAVFAC is budgeted annually by the Naval Material Command to execute these projects. All other projects are charged 6%. SIOH fees are accrued by the EFD on the basis of the accomplishment of construction work-in-place (WIP), measured in construction contract dollars.

A discussion the classes of projects, classified by funding types, that the Acquisiton Department processes is appropriate at this time. As discussed above, the largest dollar value category of the projects is the Department of Defense Military Construction (MILCON) category. Each of the military services and the various defense agencies receive a portion of the MILCON budget. From the EFD and Acquisition Department standpoint, the largest portion of the MILCON money is from the Navy portion of the MILCON budget, therefore a significant major class of projects would be Navy MILCON funds. This would include such subcategories as Navy Military Construction (MCON), Navy Reserve Military Construction (MCNR), and Navy Family Housing (NFHD). Another significant class of projects would be those which are carried as reimbursable to the MCON account. These would include such subcategories as some Air Force projects, all Army projects and Navy non-appropriated fund projects. The third significant class of projects would be "Other Direct Cites" which are EFD-accepted projects funded by direct citation and which would include such subcategories as Navy Operations and Maintainance projects (O&M,N), Research and Development projects and Navy Industrial Fund projects. Air Force MILCON (MCAF) projects would also fit into the Other Direct Cite category due to the type of funding document the Air Force chooses to use for MCAF projects. The fourth significant class of projects would be Civil Works projects in which the EFD

performs a review and inspection function of contracts let by another federal agency.

Each of the above categories of projects and most of the subcategories have different rules within which the Acquisition Department must perform its construction contracting task. An important example of differing rules would be annually expiring versus non-expiring funding types of projects. Certain projects are financed by annual funds which must be legally obligated prior to the expiration of the fiscal year. Others have no such limitations. Different types of funding require different reporting systems and, as previously discussed, there are classes of projects which produce different rates of income to the EFD. The particular subsets of rules that apply to each subcategory of projects are constraints within which the Acquisition Department must perform.

Starting with the Acquisition Department Head, the Structure and responsibilities of the departmental organization will now be discussed.

1. Acquisition Department Head, Code 09A

The head of the Acquisition Department of an EFD is usually a Navy Civil Engineer Corps Commander with extensive prior experience in the field of construction contracting. He acts for the EFD Commander/Commanding Officer in the area of facilities acquisition. Depending upon the EFD, the 09A and his department are instrumental

in the annual accomplishment of from $75 to $200 million value of construction WIP. The 09A is the head of an organization employing from 230 to over 500 personnel (including field offices), again the figure depends upon the particular EFD. The Acquisition Department staffing is usually approximately 60% of the total number of personnel employed by an EFD.

As the executive in charge of this important EFD department, the 09A is concerned with the efficient utilization of the resources assigned the department and with the efficient operation of his organization. While he is not concerned with the profit and loss considerations with which a private business executive would be concerned, he must focus his attention on producing a quality output within a semi-fixed budget and manpower constraint. He is tasked with generating revenue in the form of Supervision, Inspection and Overhead (SIOH) funds and operating within a fixed percentage of these funds. He is tasked by NAVFAC with the achievement of specific operational goals and targets, particularly within the Program III and Program IV operating plans.

The 09A's informational requirements and informational systems are the focus of this thesis. Further discussion of the Acquisition Department Head's tasks functions, and responsibilities will be made in subsequent sections.

2. Acquisition Coordination Officer, Code 09A1

The Acquisition Coordination Office of the Acquisition Department is headed by (and usually consists entirely of) a Navy Civil Engineer Corps Lieutenant Commander or Lieutenant. The Acquisition Coordination Officer usually functions as an assistant to the 09A and is tasked with coordinating the overall program for construction. The specific functions of the 09A1 tasks include acting for the 09A in his absence, monitoring the Program III and IV goals assigned the EFD, monitoring specific Military Construction fiscal programs, monitoring non-military Construction programs, monitoring departmental resource usage and conducting special studies as required or assigned.

3. Acquisition Project Management Office, Code 09A2

The Acquisition Project Management Office is usually directed by a Civil Service employee of grade GS 14 or 15. His formal title is Acquisition Project Management Officer and is commonly referred to by his code, 09A2. The 09A2 is normally tasked with the execution and monitoring of construction programs such as the MCON programs by fiscal year and the O&M,N annual program. Construction projects are grouped by fund source, fund type and fiscal year of fund availability into programs. The 09A2 and his staff of Project Managers are responsible for project execution at the individual project level.

The office coordinates the work efforts of the Contract, Design and Construction Divisions as related to specific projects and has a responsibility for the execution of the project from the feasibility study stage, through design, to construction and transfer to the user activity/customer.

The Project Management Office provides both internal control activities and project continuity throughout the life of a project. The office assures continual progress on a project and assures that legal and administrative constraints on project scope and funds are complied with. The office is usually tasked with establishing project execution schedules and assuring that they are met. The Project Managers authorize the expenditure of project funds and review the propriety of any scope, time or cost changes to the project. The Project Management Office serves as the EFD point of contact with NAVFAC for design, construction and contractual matters pertaining to projects.

4. Contract Division, Code 02

The Contract Division prepares and effects execution and distribution of contractual documents for the Acquisition Department and the EFD. The Director of the Contract Division, Code 02, is normally a Civil Service employee of grade GS 14 or 15.

In addition to the important service function of processing the great variety of paperwork involved with

contracting in an error-free and timely manner, the Contract Division also performs an internal control function. The Division assures that all contractural documents and procedures are in consonance with Armed Forces Procurement Regulations, Navy Procurement Directives and NAVFAC procurement instructions. The Division prepares/reviews and issues invitations for bids and requests for proposals, then solicits, opens and analyzes bids and proposals. Should any irregularities occur in the pre-contract award phase, the Division conducts the necessary investigations and makes the appropriate recommendations. Subsequent to the bid opening, the 02 makes recommendations regarding award to the Commander/Commanding Officer of the EFD and notifies unsuccessful bidders or proposers.

The 02 Division also has important roles in the post-contract award phase. Contract Division make interpretations of contract terms and provisions and makes recommendations as to the appropriate action to be taken relating to the interpretation. It prepares and distributes change orders to contracts. The 02 often approves partial payments to contractors and concurs in the approval of final payment vouchers. Division members participate in negotiated contract pre-selection and selection boards and contract and contract change negotiation boards. The Division is responsible for reviewing and analyzing all contract claims and making recommendations as to determination and disposition of those claims.

5. Design Division, Code 04

The Design Division, usually headed by a Civil Service GS 15, is responsible for executing the design phase of the projects assigned to an EFD. This is normally accomplished in one of two manners. Either the design is performed "in-house" by members of the Design Division or the design work is contracted out via a negotiated contract to a private architect-engineer firm. In the latter case, the Design Division administers the architect-engineer contract and insures the technical adequacy and quality of the design. In either case, the end product of the Division's effort is a complete set of plans, specifications and cost estimate that are ready for bidding, contract award and construction execution. The Division's guidelines include providing an economical design of facilities that best satisfy the functional/operational requirements of the user and that can be constructed economically.

As can be seen in Figure 2, the Division is organized into branches, based on the major architectual/engineering disciplines (architectural, structural, mechanical, electrical and civil) plus special branches including specifications, cost engineering, fire protection engineering and soil mechanics.

In addition to the tasks and responsibilities discussed above, the Division also exercises management of the NAVFAC Program III (Engineering) within the EFD, provides engineering and design support to all other NAVFAC

programs, conducts engineering investigations as required and conducts technical reviews of proposals made by EFD field personnel, construction contractors and architect-engineer contractors.

6. Construction Division, Code 05

The Construction Division of an EFD Acquisition Department comes into play subsequent to the construction contract award. The 05 Division is tasked with managing construction work performed under contract to assure economical timely completion of the construction and to assure that the construction is of the required quality and scope as defined in the contract. The 05 Division Director is usually a GS 15 Civil Service employee.

The day-to-day task of inspecting the work of the construction contractor to assure compliance with the terms of the contract is assigned to the various field offices of the Division. Field offices are located near the major centers of EFD construction activity. The field offices are headed by Navy Civil Engineer Corps officers entitled Resident Officer in Charge of Construction (ROICC) and are staffed by civilian inspection personnel as assigned by the EFD. It is through the ROICC offices that the 05 Division executes its mission. Reports of construction problems and progress are generated by the ROICC office and forwarded to the 05 Division. Contractor payment requests are reviewed and forwarded by the ROICC to the Construction Division.

The Construction Division provides guidance, advice and support to the ROICC offices and conducts periodic reviews of the functioning of the field offices. The Division administers the resources available for contract inspection and administration, including operating budgets, allocation and assignment of inspectors and training and development of inspectors. When received from the field offices, the 05 Division reviews and approves progress payments requested by construction contractors. Other support items provided to the field offices include review and approval of shop drawing and construction material submittals by the contractors, participation in negotiations with contractors, consultation with contractor representitives to clarify the requirements of the plans and specifications and to resolve technical issues, and review of the contractor's schedules and capabilities to assure timely completion of the contracts.

III. INVESTIGATIONAL PROCEDURES

Research for this thesis began with a review of available literature on the subjects of management information systems, management by exception, and management by systems. Although many general postulates regarding an executive's information needs were revealed in the literature, a specific guideline indicating an investigational technique that would be useful in solving the problem at hand was not discovered. The next research step involved discussing the problem with several professors at the U. S. Naval Postgraduate School whose expertise was in the areas of management and operations research. It was through the many suggestions made by the professors that the strategy of investigation for this thesis was derived.

The general strategy was to formulate a series of interview questions based on the applicable postulates uncovered in the literature search. These questions were designed to bring to light the relevent informational requirements of the Acquisition Department Head. First, the 09As were interviewed by telephone. Next, the interviews were analyzed to determine areas which were critical to the problem, in which further information was needed and in which detailed analysis was required. Based on this step, a series of interview questions were written and presented

by telephone to the organizational layer below the 09A; the Acquisition Coordination Officers, the Acquisition Project Management Officers and the Directors of the Contract, Design and Construction Divisions. These interviews were used to amplify the information obtained in the 09A interview and to provide a different prospective of the information flow to the 09A.

Subsequent to the interviews and analysis of the 09A informational requirements, the currently existing formal information systems were studied. It was considered important to study the existing systems in depth after the information requirements were determined in order to avoid anchoring the analysis to the current systems. The writer attempted to make the analysis of the informational requirements independent of the existing systems. Finally, the combinations of requirements and systems were interwoven into a proposal for alternate and supplementary information systems to meet the 09A relevent information requirements, as determined by this study.

The majority of the research effort expended on this thesis was in the telephone interviews of the 09As and their key staff members. The interview questions and the purposes for the questions will now be discussed.

A. 09A INTERVIEWS

The general purpose of the 09A interviews was to try to discover what the 09A's job consisted of, what critical

decisions he made and what kind of information he needed to perform those tasks and make those decisions. There are some differences between the organization and task assignments of the EFDs and the Acquisition Departments within the EFDs. There are also, obviously, differences in management style of the individual 09As. In order to make a proposal of the general informational requirements and the informational systems to meet those requirements that would be useful to all of the EFDs, the organizational differences and management style differences must be accounted for. Therefore, a portion of the interview and analysis effort was devoted to determining which aspects were common throughout the EFDs and which were functions of particular EFD organizational differences and/or 09A management style.

When the interview questions were presented to the 09As, the interviewer presented supplementary questions as needed in an attempt to expand on the answers provided by the 09As. Care was taken in the formulation of these spontaneous supplementary questions to avoid leading or biasing the answer of the interviewee.

The 09A interviews each took approximately 1 hour by telephone. The 09As from all of the EFDs were interviewed with the exception of the PACDIV 09A. PACDIV was excluded because of the difficulty of obtaining sufficient time on the overseas AUTOVON telephone link to conduct a successful interview.

Although it would have been preferable to include PACDIV's input into the analysis, the results probably would not have been changed significantly by that additional data. The recommendations of this thesis are thought to be generally applicable to PACDIV.

Following is the list of questions presented in the 09A interviews:

- What do you consider your primary duties to be?
- What do you consider your responsibilities to be?
- What are the major decisions that you make in the performance of your duties?....particularly in construction areas ... particulary in NAVFAC goals areas ... particularly in programs areas ... in other areas?
- What information do you find critical/useful in making those decisions?
- What are your major/most significant problem areas; in general; in the last year?
- Who within the organization reports to you?
- What types of information does each individual give to you?
- Beyond the information provided to you by subordinates, what other sources of useful information do you have and what types of information are provided by these sources?
    - other people?
    - in-house reports?
    - automated reporting systems?
- Whom do you provide information to?
- What types of information do you provide in a formal manner; in an informal manner?
- How do you evaluate the efficiency of the department; of the divisions; of the field offices?

- What were the most difficult problems that you faced in learning the 09A job?
- What computerized reports do you currently receive?
- How useful are these reports to you? Which aspects are the most useful?
- How do you think the computerized reports could be improved to better meet your information needs?

When the 09A interviews were completed, the responses of each 09A were compared in an overall manner and on a question-by-question basis. The comparison revealed the organizational differences and management style differences of the EFDs and 09As. It also disclosed informational requirements which were common to all. As may be expected from telephone interviews with very busy people, many of the responses were not as explicit or as complete as would have been desired. Several of the questions were too complicated for an in-depth spontaneous response. Despite these difficulties, the interview responses were valuable in that they disclosed the informational attitudes of the 09As, disclosed the key internal and external factors that were influencing their decision making and pointed out areas requiring further research by the interviewer.

The next step of the research was the formulation of key staff member interviews and the conducting of those interviews.

B. KEY STAFF MEMBER INTERVIEWS

The key staff member interview questions were designed to provide the interviewer with a deeper understanding of the specific informational requirements of the 09A, of the internal information flow within the Acquisition Department, of the division information attitudes and of the departmental differences between the EFDs. The interviews were conducted by telephone and each took from 30 minutes to an hour. The interviews involved all of the EFDs with the exception of PACDIV.

The key staff members interviewed within each EFD Acquisition Department included the Acquisition Coordination Officer (09A1), the Acquisition Project Management Officer (09A2) and the Directors of Contract, Design and Construction Divisions (02,04,05). In addition, the Assistant to the Head of the Acquisition Department at WESTDIV was interviewed. This position is unique to WESTDIV and is currently held by a Navy Civil Engineer Corps Commander. Of the twenty-five potential interviewees in the five EFDs under study, all but five were interviewed. The remaining five interviews were not conducted because of current vacancies in the position or because the individual was unavailable during the period in which the interviews were being conducted.

As with the 09A interviews, it would have been preferable to have had PACDIV's input but the conclusions and recommendations of this thesis would not have been significantly changed.

Similarly, it is the opinion of the writer that the five key staff member interviews that were not conducted would not have significantly influenced the conclusions. At least three of the five people in any given key staff position were interviewed. The input of those missed would have been valuable but sufficient breadth of opinion in each key staff position appears to have been achieved.

The basic difference among the interviews, was the spontaneous supplementary questions that the interviewer asked in order to obtain a greater breadth or depth of response by the interviewee to a specific question. As with the 09A interviews, these supplementary questions were formulated with the intent of avoiding biasing the response of the interviewee.

The primary questions asked in the key staff member interviews were the following:

- In the conduct of your business, what types of information do you normally give the 09A?
- Which of the NAVFAC goals are the most useful to you in the management of your organization? Which do you think are the most useful to the 09A?
- How do you evaluate the efficiency of your organization/division?
- How does the 09A evaluate the efficiency of your organization/division?
- If you were the 09A, how would you evaluate the efficiency of your organization/division?
- What are the most significant problems that you face in your position?

- What reports do you normally receive?
    - automated reports?
    - in-house manual reports?
    - semi-formal verbal reports?

- What improvements do you think could be made to improve the current reporting systems?

- What are some specific examples of the following types of information that would be of use to you?
    - exception information
    - non-specific-project information
    - statistical information

- How useful are the current automated reporting systems to you? Why?

The responses of the key staff members in conjunction with the responses of the specific 09As provided a profile of the 09A informational requirements and an indication of how these requirements were currently being met. Those informational requirements and informational systems will be discussed in the next thesis section.

IV. CURRENT INFORMATIONAL REQUIREMENTS AND SYSTEMS

Using the investigational procedures described in the previous section, the data on the informational requirements of the 09A was obtained. This thesis section will first describe the 09A information requirements that were found (as the result of analysis of the 09A and key staff member interviews) to be mutual to all of the 09As. Next, the existing information systems will be described. Third, the manner in which the 09As currently use those systems to meet their information needs will be discussed. Finally, several significant observations of the current management techniques and of changing management emphasis will be discussed.

A. 09A INFORMATION REQUIREMENTS

In his role as the Head of the Acquisition Department of an Engineering Field Division, the 09A must assure that the service mission of the department is fulfilled within the legal, policy, fiscal and operational constraints on the department's activities. This requires that he perform several key activities. He must interpret the objectives and goals of higher authority, such as Congress, NAVFAC and the EFD Commander, and convert these to the operational requirements of the department and of the divisions.

He must establish organizational policies and formulate an operational plan for the accomplishment of the department's mission. He must supervise the organization's execution of the plan through monitoring and control mechanisms. Finally, he must periodically evaluate the performance of his department and redirect operations as required.

To be effective in his role as a manager, the 09A requires both information and experience upon which his actions and decisions are based. The experience requirements are fulfilled by prior employment in Navy construction contracting organizations and by the "school of hard knocks", on-the-job experience.

The information requirements are currently being met by a complex system consisting of formal, semi-formal and informal subsystems. Through the medium of telephone interviews and analysis of those interviews, as previously discussed, the writer determined the mutual information requirements of the 09As in the Engineering Field Divisions and the means by which those requirements were currently being met. A discussion of those requirements and information systems follows.

Perhaps the most important information requirement of the 09A is knowledge of the constraints imposed by the system external to the Acquisition Department upon that department. This information is in the form of operating resource allocations, legal requirements, Navy and NAVFAC operating

policies, NAVFAC program goals, EFD Commander/Commanding Officer policies, military procurement regulations, availability of external resources (such as architect-engineer firms and qualified construction contractors), and assignments of current and future projects to be accomplished by the department. The 09A must then convert these assets, work assignments and other constraints into his operational plan and requirements for the individual divisions. The planning function of the 09A involves not only generating a current plan of accomplishing his mission, but also, evaluating and planning future departmental operations and determining the resource requirements to perform those operations. His evaluation of future resource requirements provides feedback to the external system for their planning and programming purposes.

Subsequent to the formulation of his departmental operating plan and policies, the 09A requires information to control the internal functioning of the Acquisition Department. Feedback information is essential to monitor departmental compliance with both the external constraints and the internal operating plans and policies. Information as to the efficiency of the division and field organizations and as to the efficiency of the Acquisition Department as a whole is necessary. Specific concerns of the 09A include how well the NAVFAC Command Management Plan and associated assigned goals are being met by the department, how well the income (WIP and SIOH) and the cost budgets for the

period are being met, and how well work is progressing toward the execution of specific design and construction programs, such as the current year O&M,N program or the previous fiscal year MCON program. He needs information to indicate where bottlenecks are occurring within the Acquisition Department "pipeline" so that these can be eliminated and a "laminar flow" maintained. It was observed that due to the emphasis of the NAVFAC Command Management Plan, the 09As were considerably more concerned with meeting performance criteria and execution plans than they were with the efficient use of departmental resources. Also, there was heavy emphasis on staying within cost targets for operations and much lesser emphasis upon meeting income targets.

An important concern of the 09A is how well the internal control system of the department is working. The possible consequences of an internal control failure are many but some of the most significant include violation of federal laws, violation of procurement regulations and violation of NAVFAC policy. Unintentional creation of contractural "loopholes" which cost time and money to resolve with the contractor result from a failure of internal controls, as do inefficient or inadequate designs. The 09A must monitor the product of the department to detect internal control problems and implement the appropriate fix.

In his role of providing a service to the customer/user activities and as a subordinate organization in a military

chain of command, the 09A must be concerned with external evaluations of his department's performance. Customer satisfaction is a function of the quality of the construction end product, the adequacy of the design in meeting the customer's needs, and the responsiveness of the department to the various requests of the customer. Higher authority satisfaction is a function of meeting assigned goals, providing necessary reports, customer satisfaction and compliance with law and policy. External feedback information is an important indicator to the 09A of the performance of the Acquisition Department.

In addition to the management of overall departmental operations in terms of goals, programs and division efficiency, the 09A also provides management guidance and decisions at the specific project level. Because of the great volume of projects and their related contracts being processed at any one time through the Acquisition Department, it is impossible (and unnecessary) for the 09A to become involved with each individual project or contract. If the operating plan and policies of the department and the internal control systems are working properly, the vast majority of the workload will flow smoothly through the pipeline. It is only the exceptional project that requires 09A's individual attention. The criteria which define an exceptional project vary from EFD to EFD depending upon the workload of the individual 09A, the management style of the individual 09A,

the strength of the individual Acquisition Department and the level of interest of NAVFAC in a particular area.

Following are examples of types of projects that would demand the 09A's personal involvement. Those projects in which NAVFAC and/or the EFD Commander have expressed a high interest usually receive 09A involvement at the project level. Problems in executing a given funding program as planned would cause the 09A to become involved in the individual projects of that program. Significant failures to meet either NAVFAC goals impacting at the project level or project execution commitments would concern the 09A. Frequently the 09A will receive telephone calls from individuals within the EFD, from NAVFAC and from the customer commands which request specific status information about a project or contract or which express a complaint about the work of an Acquisition Department component on a specific project or contract. The 09A's response requires that he refer to individual project data.

With respect to individual projects and contracts the 09A's information needs are threefold. First, he requires information to indicate whether or not an exception has occurred on a project/contract. If an exception exists, he must also know the type of irregularity. Second, in order to respond to the exeception, he must have available some or all of the available data on the project/contract.

Third, he must have feedback to assure that his decision was correct or that his information is current. The degree of feedback depends upon the type of exception and may vary from very short term, to see that specific guidance was successfully implemented, to a very long term, as in the case of a critical or high interest project.

The profile of the information needs of the Head of the Acquisition Department as determined by the analysis of the interview responses obtained in the research phase of this thesis is seen as a very deep heirarchy extending from high level external constraints down through the history and current status of every project and contract being processed by the Acquisition Department. A description of the systems currently available to provide the information will now be presented, followed by a discussion of how these systems are currently utilized by the 09As.

B. FORMAL INFORMATION SYSTEMS

In the context of this discussion, formal information systems will include automated reporting systems, routine manual reporting systems (in-house reports as opposed to externally processed standardized reports) and formal decision-making bodies. The discussion is not exhaustive of the formal information systems available to the 09A. Obvious omissions include the vast system of formal instructions, laws, manuals and policy statements which serve as guidance, authority and constraints to the 09A's function.

Detailed description of these would add great volume and little significant content to this thesis. Discussion of how the 09A uses the information presented by all the systems, including omitted formal systems, is the subject of a subsequent section.

1. NAVFAC Command Management Plan

Updated and distributed annually, the NAVFAC Command Management Plan is the basic planning document of the Naval Facilities Engineering Command [Reference 3]. Based on the philosophy of management by programs and management by objectives, the plan provides an annual statement of NAVFAC's fundamental policies, long and mid-range objectives and detailed goals for the current year for each of the nine management programs. The Command Management Plan is divided into the Objectives Plan and the Operating Plan.

The Objectives Plan consists of Command Objectives, Program Objectives, and Intermediate Goals. The command objectives is a broad statement of the objectives of the entire NAVFAC organization. The program objectives are an application of the command objectives to the management programs and thus define the long-range program-oriented objectives of the plan. The intermediate goals provide specific and quantifiable subgoals which relate to the achievement of specific program objectives.

The Operating Plan for the current fiscal year makes specific command assignments of goal targets and resources

for the accomplishment of the intermediate goals of the Objectives Plan. The Operating Plan is formatted first by management program, making specific assignments to NAVFAC organizations, and then by primary field activities, reiterating the assignments for each program. For each program, the Operating Plan establishes priorities for task accomplishment by primary field activity within assigned resources. Also for each program, the plan assigns to each primary field activity, for each Objectives Plan intermediate goal, specific quantitative achievement assignments and the resource allocation in terms of man-years and funds by fund source within which the assignment should be completed. The plan also defines the reporting requirements and formats for each activity. Finally, the plan provides a cross-reference coding between the resource assignments of the plan and the automated reporting format of the Integrated Program Management System (to be discussed in a subsequent section.)

2. Engineering Field Division Management Information System

The Engineering Field Division Management Information System (EFD/MIS) is a subsystem of the Navy Facilities System. As described in Reference 5, the Navy Facilities System is the single automated data processing system sponsored by NAVFAC. The EFD/MIS is a collection of inter-related automated data processing applications designed to serve the management information needs of the

Engineering Field Divisions and to provide summary reporting to NAVFAC Headquarters, other high authorities with the Navy, Department of Defense and Congress. EFD/MIS, composed of specific applications called data systems, utilizes three essentially non-integrated data files, Master Data Management System (MADMAN), Design Management Information System Master File and Resources Management System (RMS). Of the several data systems currently existing within EFD/MIS, three are of interest to this thesis, Integrated Program Management System (IPMS), Construction Management Systems (CMS) and Design Management Information System (DMIS). All of these systems utilize central development, maintainance and processing by and at the NAVFAC automated data processing organization, Facilities Systems Office (FACSO), located at Port Hueneme, California. EFD and NAVFAC Headquarters input to FACSO is via a dedicated off-line data telecommunications network. Processing by FACSO utilizes and IBM 360/65 computer system. Output is mailed from FACSO to the EFDs in the form of standard computer high speed printer hardcopy, xerox-process reduction hardcopy and microfiche.

a. Integrated Program Management System (IPMS)

Manhours of effort and dollars expended by the EFD against job order numbers are reported to the Resources Management System (RMS) data base. These expenditures are accumulated in an upward heirarchy of job order numbers, program tasks, program components, expense

elements, work centers, cost accounts, programs and activities. IPMS is an extract of the RMS data base. The actual expenditures by the activity are recorded, summarized and compared with the expenditure goals and plans of the activity as defined in the Operating Plan of the Command Management Plan.

The IPMS output to the Engineering Field Divisions is in the form of summarizations of accomplished time and dollar expenditures compared to expenditure goals for the EFD as defined by the specific management programs. As described in a NAVFAC publication [Reference 6], IPMS is intended to provide the EFD with the management data required to appraise program performance, to provide the basis for reprogramming of resources, to determine organizational staffing requirements, and to develop out-year funding requirements. IPMS is currently a tape oriented system processed in the batch mode, and the reports are produced monthly.

IPMS output consists of eight reports, seven of which are received by the Engineering Field Divisions. Reference 7 describes the reports received by the EFD as follows:

- Task Exception Report
- Component Exception Report

These two reports are exception reports designed for managers who want to identify tasks/components in which there are excessive variations from plan. Only those tasks/components appear on these reports which deviate from plan by 15%.

- Program Task Report

This report is designed for mid-management, offering a complete analysis of task progress vs plan. It displays man-year and dollar information by current month, actual year to date, plan year to date, percentage of plan year to date, and the annual plan. Comparisons by fund source are made at the component, program and the activity level. The Task Exception Report and Component Exception Report are extracted from this report.

- Program Summary Report

This is utilized by top management. It presents a comparison at the program level of actual man-years and dollars expended against planned figures by fund source. This is a one-page report that analyzes this information by activity and each of its programs.

- Program Manhour/Dollar Report

This report is program oriented, and is designed to be the basic working level report with a program orientation. It identifies the functional code of work center's effort involved in the accomplishment of the program's tasks, giving visibility to the buy-sell relationship between programs and functional codes. The report displays plan vs actual information by fund source against tasks within the programs. Also, the user can identify the "plan" and "actual" labor and support dollars that are involved in the accomplishment of each goal. Each activity and its programs are summarized by expense element (type of expense) by fund source.

- Labor/Support Costs by Work Center

This report intends to satisfy functional management information requirements primarily at the Branch and Division level. It is work center oriented and summarizes work centers by Department, Division, Branch, Program, Job Order Number, and at the expense element level. It identifies straight time and overtime labor, itemizes support cost and unfilled orders and compares the information against the year to date and annual plan.

- IPMS Execution Plan Display

This report displays the EFD's yearly execution plan by quarter. The report is program oriented and details the plan by task, work center and type of expense, labor or itemized support costs.

An important aspect of the IPMS reporting system as related to this thesis is that IPMS reports only expenditures of money and man-hours and the related expenditure plans. The system does not reflect in a quantitative manner what has been accomplished through the specific expenditures. Also, all labor costs are recorded as direct labor and the overhead portion of labor cannot be identified. The labor cost portion of the total expenditure, however, can be easily separated from the non-labor costs.

b. Construction Management System (CMS)

The purpose of the Construction Management System, as described in Reference 6, is to provide NAVFAC Headquarters and the EFDs with a management tool to monitor, control and accomplish construction projects from initiation of Program Cost Estimates through constructed facilities placed in inventory. CMS is oriented toward fund accounting and project/contract execution tracking.

CMS is an extract of the Master Data Management (MADMAN) data base with a limited off-line interface with the Design Management Information System data base. MADMAN is basically an appropriation accounting file and utilizes a disc oriented system. Inputs to the system from the EFD include funding data for projects and for funded work items within the projects, including individual contracts and in-house work orders. The EFD also inputs planned project execution schedules and accomplished milestone dates.

Individual contract data, contract changes and descriptive comments are also EFD inputs. Based on ROICC manually prepared reports, the EFD provides work-in-place progress of construction contracts to the system. NAVFAC inputs major funding acceptances and project authorizations. CMS is updated bi-weekly and reports are extracted both bi-weekly and monthly, depending upon the report. NAVFAC receives summary reports on all EFD projects and each EFD receives six basic reports pertaining to the projects assigned to that EFD.

The CMS Project Status Report (PSR) is produced bi-weekly and is one of the key reports of the system. This report is basically project oriented and is intended primarily for the use of the project management staff (09A2) of the Acquisition Department. There are currently four sorts available of the Project Status Report; by activity (location of the project work), by project manager, by phase (program cost estimate, design, construction) and by appropriation. The information contained in the PSR for all projects assigned to the EFD includes the project number; current phase and title; source, type and amount of funds assigned; project manager; activity location; fund obligations for contracts and in-house work; accrued costs against those obligations; contract execution major milestones, current estimate of total funds required by the project (Current Working Estimate - CWE); current estimated completion date of the project phase; and project manager's remarks.

The PSR reports are very detailed, down to the individual funding document level, and provide most of the historical and projected funding and execution data available for a project.

The Project Execution Report produced by CMS is a monthly report of the execution plan and history of each project. The report lists for each project the fund type, project number, description, CWE, construction and design contract numbers, contract amounts, original and current plan of accomplishment, previous month % complete, current month % complete and illustrative brief remarks. This report provides greater detail on project execution than the Project Status Reports and omits the financial data. The Project Status Reports and the Project Execution Report are the two CMS reports that are oriented toward projects. The remainder of the CMS reports are oriented toward contracts.

The Projected WIP Report lists, for each construction contract, the monthly accomplished and the projected construction work-in-place. For each contract, the report lists current contract value, actual and scheduled WIP-to-date (both numerically and as a percent of contract value), differences between actual and scheduled WIP, contract award date, contract completion date and an 18 month projection of the monthly WIP to be accomplished. The report then summarizes by activity, ROICC and EFD the actual and scheduled WIP-to-date, differences between the figures, current

fiscal year total WIP projection, subsequent fiscal year WIP projection and 18 month monthly WIP projection. This report is useful at several levels of the Acquisition Department. Of significance is that the report deals only with the work accomplished by the construction contractors and does not report the income generated by that work.

The Status of Construction Contracts Report is a contract-oriented monthly report sorted by ROICC and activity. The report provides for each contract the contract description, contractor name, ROICC remarks, funding type, contract award and completion dates, facility usable completion date, actual and scheduled percent complete, current contract price, total WIP to date, WIP this month, and consecutive months with no WIP. The report summarizes by activity, ROICC and EFD the number of active contracts by fund type and the total monthly WIP by fund type. This report is of use primarily to the Construction Division Director and his Branch Managers.

The Contract Data Maintainance Report is a summary of the basic data for each contract currently being administered by the EFD. For each contract the report details contract number, number of contract changes, contract description, activity name, contractor name, funding type, purpose, type and method codes, contract award date, contract completion date, current contract price, payments

prepared to date and unpaid balance. This report is used primarily by personnel in the Contracts Division and is printed received monthly by the EFD.

The Procurement Document Cross Reference is either monthly or bi-weekly depending on the EFD. The report lists for each active procurement document (funding document) the description of the procurement document purpose, fund subhead, activity code, project and phase number, project description, activity name and project manager. This report is useful in cross referencing contract numbers and other procurement document numbers to the project number.

There are several important aspects of CMS as related to this thesis that should be highlighted. All reports are fixed format resulting from batch processing. CMS is currently a transaction oriented system with little available analysis or selectivity capability. The system currently produces neither demand reports nor triggered reports. There is no capability for interactive processing. The system maintainance and development is highly centralized through NAVFAC. The CMS MADMAN data base is extremely limited from a management information standpoint in that several important data element groups are not available in the system. In order to provide comprehensive management information to the EFD, the system should process data representing resource inputs to the EFD along with data representing EFD outputs.

CMS contains financial accounting information for the various projects and contracts being prepared and administered by the Acquisition Department. It monitors execution progress on each contract. It monitors the output of the acquisition "pipeline" in terms of WIP accomplished and SIOH (income) generated. What is missing from CMS is the EFD resources utilized in generating the WIP and SIOH. The resource utilization is reported to be the RMS data base (from which the IPMS reports are extracted) and there is currently no integration of RMS and MADMAN. It can be observed that, although complete management data is available between the two systems, the partitioning of the systems prevents automated processing and analysis of the total management data into management information useful at the management control and strategic planning levels of the EFD. Both CMS and IPMS are therefore somewhat restricted to the tactical control of day-to-day operations.

c. Design Management Information System (DMIS)

DMIS is a personnel resource allocation and scheduling system primarily for the use of the Design Division of the Acquisition Department. DMIS is the most integrated of the systems discussed in that the DMIS data base interfaces with both the RMS and MADMAN files via an offline extract tape technique. DMIS is batch processed weekly and there is no interactive capability currently within the system.

DMIS, like IPMS, is oriented toward the job order rather than toward the funding document (as in CMS). There are five basic reports within DMIS and a large number of sorts within the basic reports. Because DMIS reports are not of great consequence to the discussion in this thesis, details of the individual reports will be omitted. Of importance to the discussion are the basic functions of DMIS. Input to DMIS includes the man-hours available from each branch within the Design Division on a month-by-month basis and a plan of accomplishment of each job order broken down by branch. The system then compares available manhours with workload. RMS inputs manhours and costs expended by the various branches on the job orders and DMIS reports actual vs planned expenditures of manhours and funds. Based on job order execution schedules, DMIS projects estimated manhours by engineering branch over a six month period. Based on milestone execution schedules, DMIS produces a design execution report which lists milestone schedules and accomplished milestones. Also, an impending action report is produced which lists the milestones that are scheduled to be accomplished within the next 30 days. The information that DMIS provides to CMS includes changes in estimated design completion date, the code of the design manager and the current working estimate of the design costs.

DMIS is a valuable tool to the Design Division Director (04) and the members of his staff. Within the functional areas of engineering and design, DMIS has access

to a sufficient breadth of data to provide comprehensive management information to the 04. At the current stage of implementation, comprehensive analysis and reporting is being hampered by several technical problems which appear to be in the process of being solved. Currently being developed is a capability to perform design cost analysis which will be a significant addition to the information being provided by DMIS.

3. In-House Manually-Prepared Reports

Within each Engineering Field Division Acquisition Department there exist a number of manual reports that are generated to meet the information needs of that individual department. In some cases these are reports that are required by NAVFAC and are of identical format throughout the system. Most of the in-house reports, however, are unique in format, if not in content, to the individual EFD. It is interesting to observe that many of the in-house reports duplicate the information currently being generated by the automated information systems. Other reports supplement the data provided by the automated systems and the remainder of the reports address information areas not included in the automated systems.

Of the repetitive manual reports that are required by NAVFAC, three are significant. The monthly report of construction contract status made by the individual ROICC field offices to the Construction Division is a key working report to the system in that much of the accomplished WIP

and contract execution data is extracted from these reports. The data is input to other manual reports as well as to CMS automated reports. These reports also indicate problem areas at the EFD-construction contractor interface. Other important reports generated by the Acquisition Department are the quarterly Program III (Engineering) and semiannual Program IV (Construction) progress reports to NAVFAC that are required by the NAVFAC Command Management Plan. These are reports of progress toward the performance targets assigned by the Operating Plan of the Command Management Plan. These manual reports coupled with the resource usage information provided by IPMS give NAVFAC and the EFD a complete picture of current accomplishment of the Operating Plan. A third standard report that provides information to both the EFD and NAVFAC is the Contract Summary Report. This report is required semiannually by NAVFAC but most of the Acquisition Departments generate it quarterly for in-house use. This report is a summary of number, types, and dollar value of contracts awarded and completed by the Acquisition Department during the period. Similar summary data is provided for contract change orders. The three reports just discussed are not exhaustive of the total number of standard format NAVFAC-required manual reports generated within the Acquisition Department. They are, however, the most significant of this type of reports in the context of 09A information requirements.

There are currently several manual reports being generated for strictly internal Acquisition Department and, in some cases, EFD use which could be classified as duplicates of the various CMS and DMIS automated reports. Most of these are execution tracking and status reports. Typical subjects of these reports include, MCON program execution, project schedule and execution, design schedule and execution, status of contracts, status of designs, and status of priority projects. Only one of the Acquisition Departments studied did not have at least one report of this category. The reasons expressed by the Acquisition Departments for this apparently redundant reporting varied, but the most common responses were that the automated reports were not timely enough, that the data (input by the EFD) was not reliable and that insufficient (or too much) information was given in a specific area of interest. The fact that some EFD's can function without some or all of these redundant reports suggests that individual EFDs should apply additional effort to improve the timeliness and reliability of the data they are feeding to the automated systems. It is the opinion of the writer that these reports are more a product of the organizational tendency to avoid change and the human reluctance to trust automated reporting systems than of unmet informational requirements.

Another group of internal Acquisition Department manual reports could be classified as those supplemental to the CMS, IPMS and DMIS automated reports. For the most part, these are extracts of the automated data and the NAVFAC-required manual reports that are generated to highlight areas of special interest to the Acquisition Department. Typical examples of this type of report are Urgent Minor MCON Projects Execution Report, Minor Construction Project Status Report, Summary of Contract Change Orders Report, extracts of management ratios and Program Execution Management Information Center Charts. These reports are significant because they indicate a need for management information that potentially could be satisfied by the evolution of the automated reporting systems. Satisfying these information needs appears to be the next logical step in the development of IPMS, CMS and DMIS.

The final significant grouping of manually prepared in-house reports are those which provide information not currently addressed by the automated reporting systems. This group includes such reports as Status of Contract Claims, Personnel Status Reports, Projects Physically Complete but not Fiscally Closed Out Report, Cost Analysis of In-House Designs, and assorted custom reports to cover unique contracting or construction situations. Some of these reports are potential areas for future development of the automated reporting systems.

4. Scheduled Briefings and Formal Bodies

The final category of formal information systems of use to the 09A is the formalized meetings of management bodies within the Acquisition Department and the EFD. There are two significant divisions within this category, the meetings of those bodies in which the 09A is a subordinate member and the meetings of those bodies in which the 09A is the head.

Bodies in which the 09A is a subordinate member are usually headed by the Commander/Commanding Officer or the Deputy Commander/Executive Officer of the EFD and consist of the EFD Department Heads and other EFD key staff members. These meetings are of somewhat fixed format and usually scheduled to meet periodically. The frequency of these meetings varies among the EFDs from a maximum of semimonthly to a minimum of quarterly. At these meetings, the EFD head is usually briefed as to progress in execution of the NAVFAC programs and progress in critical areas of interest. Discussion of problems requiring high level resolution is often entertained. EFD general policies are promulgated and amplified at these meetings and changes in command priorities are presented.

Those bodies in which the 09A is the head usually consist of the key staff members of the Acquisition Department, 09A1, 09A2, 02, 04, and 05. Again, the frequency of the meetings of these bodies vary among the EFDs.

The most frequent is three times per week and the least is monthly. At these meetings the primary topic of discussion is project or contract problem areas. Briefings are given of progress on high interest projects and of follow-up on prior problem solutions. The 09A presents priority policy and strategy changes and receives program status reports for Program III and IV progress. Inter-divisional problems are discussed and resolved. These meetings serve as a vehicle by which the 09A can both receive and distribute management information.

C. SEMIFORMAL AND INFORMAL INFORMATION SYSTEMS

The classification of semiformal information systems is intended to include all messages, letters, memorandums, conversations and other communications which are carried on from day to day within the structure of the chain of command of NAVFAC, the EFD and the Acquisition Department. The informal information systems are the "grapevine" - the interpersonal and interorganizational linkages which are not prescribed by policy or tradition. The vast majority of the 09A's interaction with information systems is with the semiformal systems. The format of interaction varies considerably, depending primarily on the management style of the organization, the management style of the individual 09A and the sufficiency of information provided by formal systems. Convenient classifications of the semiformal systems for purposes of discussion would be "people to paper" systems and "people to people" systems.

1. "People to Paper" Systems

The flow of paperwork into, out of and within the Acquisition Department carries with it a large volume of information. Significant examples of the paperwork include daily ingoing and outgoing telegraphic-type messages; daily letters to and from, for example, NAVFAC, customer commands, contractors and EFD field offices; intra-EFD memorandums; contractual documents and contract payment vouchers. The amount of the paperwork seen by the 09A varies considerably from individual to individual. All of the 09As have established rules defining the conditions upon which a particular document will be routed to or through him, depending upon the individual 09A's perception of his own information needs and his definition of the range of authority of his subordinates. The conditions usually require that all of certain types of paperwork such as incoming telegraphic messages and exceptional portions of other types of paperwork be routed through the 09A.

2. "People to People" Systems

The daily workload of the 09A involves person to person contact with many individuals both within and outside of the Acquisition Department. The telephone is a valuable tool and much of the 09A's time is spent in telephonic conversations. In addition to telephone calls, the 09A's personal contacts occur during visits to construction sites

and field offices, in conversations with key Acquisition staff members, in conversations with other EFD employees, in conversations with the EFD Commander and Deputy Commander and during participation in various ad hoc management bodies. Some of the information received by the 09A is unsolicited, such as a complaint from a customer activity or an order from a more senior officer. A large part of this information, however, is solicited by the 09A in a number of ways.

Much of the information is received by the 09A in response to his request for a briefing on a particular subject of interest. This varies from asking a simple question to requesting a special staff study. Other informational responses are triggered by rules. As with the paperwork flow within the Acquisition Department, the 09A must establish rules which limit the volume of the flow of relevent information to him down to a manageable amount. Each 09A has, therefore, established a set of exception criteria which determines the parameters of the problems that he desires be brought to his attention.

Because of the timeliness of the information they receive and the amount of selectivity of information available to them, most of the 09As consider the people to people information system to be the most relevent and reliable of all of the systems discussed. The 09As rely heavily on the information provided them by their key staff members. A significant observation, however, is that much of the

people to people information is extracted from the formal information systems.

D. SYSTEM UTILIZATION BY THE 09A

The previous sections have described the informational requirements of the 09A and the systems currently available to meet those requirements. This section will discuss how these informational systems are being utilized by the 09As in the performance of their work. As with previous discussion, this section will deal with the typical uses of the systems. There is, of course, some variance among the 09As.

The 09A receives information as to the external constraints upon his department primarily through the NAVFAC annual operating plan and through his key staff members' knowledge of the standing body of regulations. Each key staff member has a particular area of expertise in which he strives to maintain currency. The Contract Division Director provides the 09A guidance as to the requirements of the various military procurement regulations. The key document in this area is the Department of Defense "Armed Services Procurement Regulation", Reference 8, through which the Secretary of Defense establishes the basic procurement policies, procedures, authority and controls over the procurement function of the entire Department of Defense. Also of key importance in this area is the NAVFAC "Contracting Manual", Reference 9.

The Director of the Design Division provides the 09A with expert knowledge of the key regulatory documents in the design area, the Department of Defense "Construction Criteria Manual", Reference 10, and the NAVFAC "Design Manual" series, Reference 11. The Director of the Construction Division is also an expert in the NAVFAC "Contracting Manual" as well as the NAVFAC "Construction Quality Control Manual" and "Contract Negotiators; Guide for Construction", References 12 and 13. The 09A can rely on the Project Management Officer for expert knowledge of the annual Military Construction Authorization and Appropriation bills as well as the NAVFAC "Contracting Manual" and Reference 14, the NAVFAC "Military Construction Program Management" manual.

The documents mentioned in the above paragraph are some of the key regulatory documents which provide the 09A with information as to the external constraints upon the operation of his department. The documents are primarily codification and interpretation of the federal laws which impact upon military procurement. In addition to his own and his staff members' knowledge of these requirements, the 09A can also receive interpretive information from the Commander/Commanding Officer of the EFD, the EFD Legal Counsel, and various NAVFAC staff members.

Information as to the annual resource allocations to the Acquisition Department is available to the 09A through the NAVFAC Command Management Plan and the operating budget of the EFD.

Information as to assignments of work is obtained directly from NAVFAC for most projects and from the customer agency or activity for other projects.

The planning information required by the 09A is in terms of future workload and assessments of the resources required to accomplish that work. The CMS Projected WIP Report is of limited use in analyzing the future workload because not all potential future work assignments are included in the report and the algorithm used in projecting WIP is not considered entirely satisfactory for certain types of projects. Most 09As rely upon manual projections of WIP prepared or compiled by the Project Management Officer. Assessment of future period resource requirements are prepared manually by the Acquisition Department staff members based on various "rules of thumb" and intuitive estimates. Information as to the budgeted resources remaining for current period operations is provided quite satisfactorily by the IPMS system.

The control information required by the 09A is in the form of feedback as to the compliance with constraints, the efficiency of operations, the functioning of the internal control system and the external evaluations of the department and its components. Feedback of compliance with external constraints such as procurement regulations is provided primarily from NAVFAC in the form of letters and telephone calls as well as from the feedback of the Acquisition

Department internal control system. The IPMS system provides the 09A with information as to the degree of compliance of the department with resource usage plans. Information as to the compliance of the department components with the internal operating plans and policies of the department is provided to the 09A primarily through briefings by key staff members and by the 09A's personal observation of the day to day operations.

The information required by the 09A to evaluate the efficiency of operations of the acquisition organization is largely subjective due to the evaluation techniques of the 09As. Efficiency is judged largely by the degree of compliance with the NAVFAC Command Management Plan, by the manner in which the MCON programs are executed and by a number of subjective criteria such as the number of problems that a particular division or field office brings to the attention of the 09A. Command Management Plan progress information is available primarily through IPMS reports and the manual reports to NAVFAC. The manual reports and briefings by key staff members responsible for the execution of portions of the plan provide the most useful information to the 09A. The monthly WIP report from the CMS system receives considerable attention because of the importance of WIP accomplishment. The execution of the MCON programs is monitored by CMS Project Status Reports, by in-house manual reports and by Project Management Officer briefings. Because of the great volume of the semimonthly Project Status Reports (800 to 2000 pages),

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the 09As rely primarily upon the manual reports and the briefings. To a large degree, the 09As evaluate efficiency in a subjective manner based on daily observations of performance, by current problems and by field visits. Quantitative techniques of efficiency evaluation are, for the most part, nonexistent.

To evaluate how well the departmental internal control system is working, the 09As rely primarily on sampling techniques and review of final documents. The 09A's review of documents for signature and of outgoing correspondence provides much of this information. Observation of the number and type of internal control problem resolutions that are brought to his attention is another source of information.

External feedback through telephone calls, messages and letters provide the 09A with information as to the evaluations of key external organizations. NAVFAC, customer and EFD feedback are valuable inputs to the efficiency evaluations of departmental components.

At the individual project level, the 09A requires information as to exceptions, detailed exceptional project data, and feedback information on the execution of and the results of 09A decisions. Exception information is currently provided to the 09A primarily by verbal communication of several sorts. The meetings of formal management bodies provide much of this information by highlighting problem areas as influenced by current priorities.

High level interest as expressed verbally by the Commander/ Commanding Officer of the EFD or in a telephone call or message from NAVFAC also indicates exceptional projects. Customer complaints point out exceptional projects. Execution schedule slips are a key indicator of problems within an individual project and this data is usually reported verbally to the 09A. Certain projects are tactically important to achieving various NAVFAC goals thus these become high interest projects.

When the exceptional project is brought to the attention of the 09A he requires data upon which to base a decision and/or information with which to monitor the project progress. Most of the project history and key data is provided to him verbally by the project manager, ROICC or key staff member, although he may occasionally obtain some or all of the data from the CMS reports. Status reports of project progress are usually obtained from verbal briefings or from the in-house manual reports. Feedback information on the results of an 09A decision is usually presented in a verbal brief.

E. SIGNIFICANT OBSERVATIONS

One of the most significant observations of the 09A's use of information systems to meet his informational requirements is the high degree of reliance placed upon in-house manual reporting systems, formal management bodies and

people to people information systems and the low degree of direct reliance upon automated reporting systems. Also of significance is the predominance of intuitive management as opposed to quantitative management techniques. There are several reasons why these conditions exist. Probably the strongest incentive for this typical management style is that it is traditional and it works. Acquisition Departments have been managed successfully using these techniques since long before the advent of automated reporting systems. 09As do not rely directly upon the automated reporting systems because the systems have not evolved to the point where they are specifically and conveniently addressing significant portions of the 09A's information needs. The automated systems are designed to perform a massive record keeping operation but produce little information useful at the executive level. The 09A must therefore rely on manual digestion and analysis of the data currently being produced by the systems and upon duplicate and supplementary information being produced manually in-house. The predominance of intuitive management over quantitative management techniques is also partially a function of the lack of development of quantitative techniques and standards.

A need for more formalized management techniques has recently been expressed by NAVFAC in the form of the appointment of a study group to review the Command Management Plan. In the appointing memorandum, Reference 15, the group was

charged with reviewing the Command Management Plan and its implementation and proposing revisions to the Plan which will enhance its use as an effective, practical and basic management tool. The conclusions and recommendations of the study group, reported in Reference 16, expressed a need for greater emphasis on the management of products or output as opposed to management of resources or input. The report states "The process needs to be more precisely defined to include formal systems for determining Command Priorities and for appraisal of effectiveness." The report recommended specific improvements to the Command Management Plan which will be implemented over the next two years.

In consonance with increasing emphasis by NAVFAC on formalization of systems and effectiveness appraisal, the next section of this thesis will recommend the development of a series of automated reports to better meet the present future informational requirements of the 09A.

V. PROPOSED AUTOMATED REPORTS

Automated reporting systems will never be able to provide all of the information required by the 09A to manage the Acquisition Department of an Engineering Field Division. The existing systems, however, can be advanced to the point where they are providing management information in a convenient format and mode that satisfies many of the specific mutual information needs of the 09As. This thesis section will propose a series of reports to be added to the Engineering Field Division Management Information System family of reports which are formatted to satisfy some of the specific 09A information requirements. Prior to discussing the specific reports, the writer's reasons for recommending further development of automated systems vice other systems will be discussed and the changes to the existing automated systems necessary to accomodate the recommendations will be described.

A. REASONS FOR RECOMMENDING AUTOMATED SYSTEMS

The most convenient scheme for the evolution of 09A information systems would be for development based on status quo, utilizing intuitive management techniques and high reliance upon people to people systems and customized manual reporting. This would require no great changes in familiar operational techniques or organizational relationships.

In the opinion of the writer, however, there are very strong arguments for more formalization and automation of the information systems.

The current environmental trends impacting on Navy construction contracting include decreasing personnel allowances and increasing workload. The business is becoming increasingly complex. New environmental considerations, safety regulations, contracting techniques, procurement regulations and priorities are making the acquisition "pipeline" longer with more pitfalls. Intuitive people to people management and manual reporting systems require manpower and skills that are fast becoming scarce as the result of tighter budget constraints. Labor intensive management techniques are becoming a luxury that the NAVFAC system may soon be unable to afford. Initial attempts to relieve labor intensity has resulted in the Contractor Quality Control Program [Reference 12] which has shifted emphasis from Navy direct inspection of construction quality to Navy surveillance of the contractor's quality control program. NAVFAC's increasing emphasis on organizational efficiency as discussed in the previous chapter is another indication that the current degree of labor intensive management is a luxury.

A potential means of dealing with increasing complexity of operations and with decreasing labor assets available to the management technique is to provide automated management information.

Automated reporting systems have the potential of increasing the breadth and depth of an individual manager's control and of decreasing the manhours of work required to provide him with the information he needs to manage. If properly designed and implemented, further development of the existing automated information systems to directly provide a larger portion of the 09A's information requirements could result in a number of benefits to the Navy's facilities acquisition system. 09A's direct use of the automated systems would result in a significant increase in the timliness and reliability of the data being input to the systems by the lower organizational levels of the Acquisition Department. It would result in the elimination of many of the redundant and supplementary manual reports being generated by the Acquisition Departments and in greater utilization of automated reports at all levels of the departments.

Increased emphasis on use of automated reporting systems could encourage the quantitative evaluation of organizational efficiency and of performance versus potential within the Acquisition Department. This, in turn, could promote the more efficient use of the assets available to the Acquisition Department. The depth of management capabilities throughout the acquisition process could be increased as the result of the increased operational research and analysis that would be performed by the developers of the automated systems.

Efficient management techniques could tend to become standarized among the various Acquisition Departments and performance standards could be developed. End results could include rendering of faster decisions, accomplishment of more management with available time and performance of more thorough management analysis. All of the glorious things just discussed, however, are highly contingent upon adequate operations analysis effort, proper system development and proper system implementation. Of key importance is communication between the system users and the system developers. The 09A must take an active role in the development, implementation and evaluation of the system. Another key item is training of the system users. The users in all levels of the organization must be made aware of what the automated reports were designed to do, what the various informational elements represent and how the information can be used to help them perform their duties. A total management education process is essential in order for the automated information system to effectively serve the needs of the users.

There currently is a major roadblock which limits the potential of further development of the automated information systems. As previously mentioned, the partitioning of the RMS and MADMAN data bases seriously restricts the uses of the system. Fortunately, this situation is currently being resolved and that is the subject of the next section.

B. DATA BASE INTEGRATION

Currently, the RMS data base contains information on the EFD resources, manhours and funds that are consumed in the acquisition process. The MADMAN data base contains information on the project funds consumed in the acquisition process and on the output of the acquisition process; execution milestone accomplishment, construction work in-place and SIOH funds. Together, the two data bases present a very complete picture of the inputs and outputs of the acquisition process, all of the data that is necessary for comprehensive management analysis. Unfortunately, the data bases are not currently integrated therefore the amount of analysis that can be done using either data base is limited. The complete picture is simply not available to the computer at any one time. Fortunately, this situation is being resolved.

In order to simplify the accounting, disbursing, reconcilaiation and auditing of MILCON and O&M,N funds between NAVFAC, the EFD, the Treasury Department, the Naval Comptroller, Navy Regional Finance Offices and the contractors, a new system is currently being designed called Integrated Disbursing and Accounting (IDA). IDA will be designed to receive certified partial payment invoices into the system, automatically audit and compute payment amounts, review and validate automatic payment preparation, prepare contractor's payment checks and perform a post-disbursement audit.

The system, when implemented, will greatly reduce the amount of time required between contractor invoice submission and contractor payment. It will also greatly reduce the number of source documents and reconciliations required to perform the accounting function. IDA is expected to be implemented sometime during FY 1976.

The significant aspect of IDA as related to this thesis is that it requires the integration of the RMS and MADMAN data bases. This will eliminate many duplicate transaction entries that are currently necessary and will allow restructuring of the CMS and IPMS reporting systems to provide more comprehensive management information to NAVFAC, the EFDs and, in particular, the Acquisition Departments. The next section of this thesis will suggest some specific reports and management information topics which should be of direct benefit to the 09As and of indirect benefit to the entire facilities acquisition system. These suggestions should be seriously considered in the future development of CMS and IPMS systems.

C. 09A AUTOMATED REPORTS

The 09A reports being recommended by this thesis are intended to be only the first step in the future development of the EFD/MIS reports for the use of the Acquisition Department. The reports are all fixed format periodic reports.

After these reports have been designed and fully implemented, the subject of the demand and triggered reports should be considered. Until that time, the process of making the fixed format periodic reports a working tool will be instrumental in preparing the system users for more sophisticated reporting methods. The stage will be set for the introduction of such tools as level of detail selectivity, direct prediction assistance and interactive data exploration. As management criteria are tested and selected as relevent for reporting and recording, NAVFAC-wide statistical studies may be made for the purpose of developing "industry standards" of performance and efficiency among the Engineering Field Divisions and ROICCs. A series of relevent periodic reports for the use of the 09A is seen as the essential first step in the evolution of construction contracting management information systems.

The reports that are being recommended are based on the philosophy that the 09A does not need to know everything. His information systems must provide the minimum amount of vital information so he'll know when performance is satisfactory, how to spot trouble in time to take corrective action and how to make key decisions with a high probability of being correct.

The proposed reports include an 09A Project/Contract Exception Report, a Program Status Report, and a Goal Progress Report.

The discussion of these reports is not intended to suggest the ideal or most useful format for the reports. The important point is the content and general purpose of the reports. Formatting will require additional input from the 09As in conjunction with the programming effort to design the most useful layout. Also, these reports are not intended to provide all of the information requirements of all or any of the 09As. They were conceptualized from the analysis of the mutual information requirements of the 09As. They represent a family of 09A-directed automated reports for which data does or soon will exist in the Naval Facilities System data banks and for which programming and report generation appears to be fairly routine. The reports focus upon some of the more critical tasks and decisions of the 09As and are intended to provide much of the information that is necessary in performing those tasks and making those decisions. This thesis section will conclude with a discussion of several management information topics that appear to be relevent to the 09A.

1. 09A Project/Contract Exception Report

The essence of an exception-oriented system of control at the executive level involves prescribed checks on key operations and processes which flash a warning signal if certain limiting criteria are violated. Following the warning, the executive must initiate positive intervention to correct the error or reorient the process toward acceptable parameters.

Currently, the 09A relies heavily on the people to people and manual reporting systems for exception information. When he receives an indication of an exception, he then takes action to immediately correct the exception, study the problem or monitor the progress. The 09A Project/Contract Exception Report is intended to provide exception information on the lowest level in the informational heirarchy that he should monitor on a regular basis.

The report is essentially an extract of the Construction Management System reports. The information generated for the CMS reports should be reviewed by the computer for violation of exception thresholds that are of an interest to the 09A. Those projects or contracts which violate the exception thresholds would be listed on the 09A Exceptions Report along with the criteria that had been exceeded. After the listing of current report exceptions, the previous period report exceptions would be listed in order to provide follow-up information. In addition to the automatic listing of exception criteria violations, the report would allow the insertion of special exceptions by NAVFAC or the EFD which would cause the specific project and the special exception to print out on the report along with the standard exceptions. The special exceptions printout would not be the result of computer analysis, but rather, as the result of manual insertion of an exception. Initially, the report should utilize a set of standard exception criteria that is common to all of the EFDs.

If standard criteria are eventually determined to be unsatisfactory, the report could be adapted to specific criteria requirements as established by each Engineering Field Division. In either case, there should be significant correlation between the exception criteria and the performance goals of the NAVFAC Command Management Plan. Figure 3 shows a sample of how the report could possibly look and also lists some example exception criteria. The exception criteria list presented is not intended to be exhaustive of relevent criteria. The quantitative elements of the criteria shown on the list are only examples. The exact criteria to be used is a subject of research for the report developers.

The 09A Exception Report would provide the 09A with assurance that he is made aware of all projects and contracts that are going or have gone bad in terms of the quantitative exception criteria. The current nonautomated information systems now provide this type of information in a haphazard manner without the thoroughness of review and reporting that the computer could offer. Based on the information provided by the report, the 09A would obtain any necessary additional information required from either his staff or other reports and then initiate corrective action. The key aspect in designing this report is that the exception thresholds chosen be broad enough to be appropriate for 09A attention. If the limits are too narrow, trivial information will be presented at the executive level.

EXAMPLE 09A EXCEPTION REPORT AND CRITERIA

09A PROJECT/CONTRACT EXCEPTION REPORT

ACTIVITY: Birdfarm California NAS DATE: ______

PROJ	PHASE	CONTRACT	DESCRIPTION	EXCEPTION
127	F76	750530	Des A/C Hanger	1. Des completion date changed by DMIS from 5/75 to 9/75. 2. 60% submittal gt 30 days late. LAST REPORT: None
135	C75		BOQ	1. Project CWE exceeds funds available. 2. No WIP recorded for gt 30 days. 3. Change orders gt 5% of contract awd amount LAST REPORT: 1. Change orders gt 5% of contract awd amount.

EXAMPLE EXCEPTION CRITERIA

1. Design submittal milestones not met within 30 days of due date.
2. Design completion date changed.
3. Design CWE exceeds funds available.
4. Major claimant revalidation not recd w/in 30 days of adv.
5. BOD greater than 90 days past original CCD.
6. Change orders greater than 5% of original contract awd amt.
7. Claim action pending.
8. Contract not closed out w/in 90 days after BOD.
9. Early advertisment authorized by NAVFAC.
10. No progress for greater than 90 days.
11. Urgent Minor Project.

FIGURE 3

This has the potential of stimulating 09A involvement in problems more appropriately handled at lower levels in the Acquisition Department.

The concept of the 09A Project/Contract Exception Report is considered by the writer to have considerable value at other levels of the Acquisition Department. The 09A exception criteria but with narrower limits would be relevent at the Division Head (09A2, 02, 04, 05) level. With even tighter limits, the report would be very useful at the Project Manager, Design Manager and Branch Manager levels. Ideally, the 09A Exception Report would be the top level of a three-level family of reports. The second level would be the division head exception report. This level of reporting would produce individual reports aimed specifically at the individual Division Heads and Project Management Officers. The exception thresholds for each report would differ, depending upon the area of responsibility of the intended report user. The criteria would include the 09A exception criteria for which the report user would have some responsibility plus additional criteria as appropriate for the individual key staff member's information needs. The third level would be similar to the second level but the exception projects and contracts would be sorted based on the code of the individual Project, Branch and Design Manager.

At the two lower levels of exception reports, anticiptory exceptions would be useful in addition to the negative-type exceptions. These would provide a warning of key milestones due within some period in the future and would serve as a reminder of items of action to initiate or complete.

The 09A Project/Contract Exception Report would both partially replace and partially supplement the current sources of exception information. It would also provide the 09A with a degree of feedback on the resolution of problems on specific projects. A summary printout at the end of each report of the number of each type of exception criteria reported on the current period report and on the previous period would give the 09A an indication of potential bottlenecks and developing problem trends. The greatest value, however, is that the report would provide the 09A with a concise and thorough review of problems subject to quantitative evaluation at the micro-level of his organization, projects and contracts.

2. Programs Status Report

One of the key factors that the 09A considers in his evaluation of the effectiveness of the various subdivisions of the Acquisition Department and of the Acquisition Department as a whole is how well the current and prior years Navy military construction (MCON) program is progressing.

The importance of the MCON program is emphasized by the formulation of the performance goals within the Program IV section of the Command Management Plan. (The dual use of the word "program" may be confusing at this point. Program IV, entitled "Construction Program", is one of the nine NAVFAC command management programs through which NAVFAC performs its mission. The programs discussed in this section are the groups of projects that are authorized and funded annually by a common funding type. Examples include MCON, MCNR, MCAF, MCA, MCAR, Family Housing, and O&M,N.)

09A emphasis on the MCON program is valid not only because of the NAVFAC emphasis but also because the MCON projects are the largest source of workload and revenue to the Acquisition Department. Several of the EFDs currently have manual reports of the status of the various fiscal year MCON programs. Because of the large degree of emphasis on the MCON programs, there unfortunately appears to be some de-emphasis on the "health" of the other programs being executed. There are currently no documentary reporting systems which look at the status of all of the various programs. If the 09A were able to review the status of the execution of each of the programs being executed by the Acquisition Department, he would have a much broader picture of the overall performance of his department. Also, the additional management exposure that the execution of all of the programs would undergo would help assure that proper attention is given to the individual projects by all levels of the organization.

The proposed Programs Status Report is intended to present relevent information relating to the status of execution of each major program by fiscal year (FY). The number of fiscal years of a particular program that are being executed by the Acquisition Department at a given time varies with the type of program. The programs that are MILCON-types (MCON, MCAF, MCA, FHD, etc.) are usually the largest and longest-term projects and the funds for the projects are essentially non-expiring. Consequently, there are usually at least four different fiscal years of a given program being executed at one time; the second out-FY projects are in the preliminary planning stage of Program Cost Estimate preparation, the next FY projects are in the process of being advertised, awarded and constructed, and the prior FY projects are being constructed and completed. There also may be individual projects from the second prior fiscal year which are being completed. The programs with expiring-type funding (O&M,N) are of much shorter duration, therfore there are fewer fiscal years involved. The Programs Status Report must be able to provide status information on each fiscal year of a particular type of program which is not 100% complete plus be able to accomodate a mixture of execution phases within each fiscal year.

Figure 4 is an example of how the Programs Status Report could potentially be formatted. The report would consist of a single page for each fiscal year of each program.

EXAMPLE PROGRAMS STATUS REPORT

PROGRAM: ______________________________

# PROJECTS AUTHORIZED _________________

% DESIGN ______ % ADV __________ % CONST _______ % BOD_____

$ PROJECTS _____________________________

$ FUNDS ASSIGNED ___________ % OF AUTHORIZED ______________

% ASSIGNED FUNDS OBLIGATED _________________

CWE OF PROJECTS AUTHORIZED _________________

% DESIGN ______ % ADV _________ % CONST ________% BOD _____

DESIGN EXECUTION SCHEDULE, # PROJECTS

PLANNED:
CURRENT:

DESIGN EXECUTION SCHEDULE, % CWE

PLANNED:
CURRENT:

CONSTRUCTION EXECUTION SCHEDULE, # PROJECTS

PLANNED:
CURRENT:

CONSTRUCTION EXECUTION SCHEDULE, % CWE

PLANNED:
CURRENT:

LATEST DESIGN COMPLETION:

PROJECT TITLE

LATEST CONSTRUCTION START:

PROJECT TITLE

LATEST BOD:

PROJECT TITLE:

PROGRAM NOTES:

FIGURE 4

An important aspect of such a report is that the data be presented in terms of both the number of projects in the program and the construction CWE of those projects. Funding data should be provided to indicate the current total authorized funding for the program, the current amount of funds assigned (available for obligation) and the obligated amount of the funds assigned. The percent of the projects in each phase of execution should be indicated. The design and construction execution progress to date and the execution plan by quarters should be presented. Based on the current execution schedules of the individual projects, the projected or actual dates of the last project design completion, construction start and beneficial occupancy should be listed along with the name of the project or projects having that characteristic. The report should print out program notes at the end of each page. This would allow both NAVFAC and the EFD to enter appropriate comments and/or reminders for the printout.

The Programs Status Report would allow the 09A to review the status of each major program being executed by his department. In a compact summarized manner, it would provide him with a picture of the total workload of the department for the current and future fiscal years. In the same manner that the 09A Exception Report would indicate "sick" projects, the Programs Report would indicate those programs which require management attention.

The early editions of the report should emphasize the execution of the programs as this is where the majority of the emphasis lies at the 09A level. As the report evolves, however, efficiency-related statistics should be added to the information provided. Potential ratios of interest could include design costs per construction CWE, contract administration costs per construction CWE, total costs per construction CWE, and net SIOH generated. These program-level statistics could be useful in generating performance standards for program execution and in spotting execution cost trends.

3. Goal Progress Report

The Acquisition Department is almost exclusively concerned with the Program III (Engineering) and Program IV (Construction) sections of the NAVFAC Command Management Plan. The discussion of this thesis subsection, however, is addressed toward the entire Command Management Plan because the comments appear to be generally applicable to all of the Programs and not restricted exclusively to III and IV. Currently, the EFD progress toward the achievement of the NAVFAC Command Management Plan is monitored via two types of reports. The consumption of the resource allocations by the EFD in the accomplishment of the plan is reported in the IPMS reports. The progress toward achievement of the plan's performance goals is monitored by a manually prepared report that is submitted semiannually by the EFD to NAVFAC.

Within the various Acquisition Departments, the goal progress is usually monitored monthly through verbal briefings and manual in-house reports.

NAVFAC and FACSO are now in the process of developing an automated report which will extract from the MADMAN data base information indicating EFD progress toward certain of the Program IV (Construction) performance goals. This will replace a portion of the manual reports currently being submitted. Upon completion of the automated report implementation, monitoring of EFD progress toward the accomplishment of the Command Management Plan will then require review of three separate reports as compared to the two reports as previously required. Rather than simplifying the accessability of management information, the new automated report, as designed, appears to be complicating the situation. Even if the new report were to monitor the EFD progress toward all of the Command Management Plan performance goals, the reporting would be far from optimal. All of the essential information would not be available on one report presented in a convenient manner. IFMS would continue report the resources used in operations. The new report would itemize progress toward performance goals. The important management comparisons of the amount of resources used to accomplish specific performance goals would continue to be unavailable.

With growing emphasis by NAVFAC on efficient use of resources, it appears that the future of Command Management

Plan development and goal progress reporting should be directed toward the integration of resource allocation and operational performance to facilitate managerial analysis. It is this concept that is the basis of the following recommendation of an integrated Goal Progress Report. An example format for the report will not be enclosed because any format will be a function of the management factors yet to be developed. What is considered most relevent at this time is the basic concepts of such a report and the system analysis work required to produce the report.

The current Command Management Plan structure consists of both quantitative and qualitative performance goals. It is recommended that future Plans place particular emphasis upon quantitative measures of performance to facilitate management evaluation and analysis. To implement this recommendation will require that system analysis be performed to develop relevent quantitative measures of performance and that statistical studies be undertaken to evaluate useful standards to serve as the annual targets of these performance measures. Currently, the Command Management Plan is two dimensional. It emphasizes output performance goals and it emphasizes input resource usage plans. It is recommended that these dimensions be integrated in the development of future Command Management Plans. Resource allocations and budgets are essential to management planning

and control and should remain an important portion of the Command Management Plan. The concept of performance goals, however, must emphasize both output and input, effectiveness and efficiency. In order to accomplish this, the future performance goals must integrate both product and resource utilization into relevent quantitative management factors.

As the Command Management Plan is developed in the future, the Goal Progress Report should be redesigned to accommodate the plan and its accomplishment; to present the management information in clear, concise and timely manner. Automation of the Goal Progress Report offers several advantages over the existing methods of reporting goal progress. First, it would facilitate consolidation of the progress reporting. Second, it would emphasize quantitative over qualitative measures of performance which would facilitate management effectiveness and efficiency evaluations. Third, it would allow the development and reporting of complex performance factors which would otherwise be impractical for generation by manual reporting systems. Fourth, it would facilitate the development of relevent management standards and variances for use in control and planning. The automated Goal Progress Report, developed as recommended herein, would provide the 09A (and his contemporaries in other aspects of the NAVFAC mission) with a wealth of management information with which to evaluate, direct, redirect and plan the operations of his department.

4. Other Management Information

Prior discussion within this thesis section has recommended that three reports be generated for the use of the 09A. This section will not recommend a specific report, but rather, will discuss several areas of management information that are relevent to the 09A in the performance of his duties. These aspects of management information should be considered for incorporation into future automated management-level reports.

a. Productivity and Efficiency Ratios

The management information subject that appears to be of the greatest potential utility to the 09A is income versus costs, operational productivity and efficiency. Within acceptable quality standards, the 09A should seek to achieve a high ratio of output to input for departmental operations. To date, there has been little effort to quantitatively evaluate the efficiency of the Acquisition Department and its individual components. It is the opinion of this writer that because of the increasing complexity of work and declining personnel resources, quantitative evaluations of efficiency and productivity would be extremely useful to the 09A. It would help him to allocate his staffing resources in the most effective manner, to spot wasteful procedures and processes, and to gain a better prospective of input versus output. It is evident to this

writer that management of the Acquisition Department strictly by use of efficiency ratios would be far from optimal and perhaps even dysfunctional It is important, however, to make this information available to the 09A for his use in conjunction with subjective management factors. Comprehensive feedback to the 09A will allow more comprehensive management on his part.

In addition to the integration of the RMS and MADMAN data bases that is currently underway, another change in the data structure that would be useful in providing productivity and efficiency information is suggested. Currently, all labor hours and costs are recorded as direct. It would be very meaningful to segregate the overhead portion of labor from the direct portion and thus provide another dimension for management analysis.

Two specific informational aspects that should be considered in generating efficiency ratios are controllability and basis of comparison. The information output should be formatted to conveniently illustrate controllable elements of costs. It is the controllables and the relevent uncontrollables that are meaningful to the 09A in his decisions. Also, the output of the information should allow convenient comparisons between current and prior period accomplishments and between current accomplishments and the planned or standard accomplishments.

These comparisons provide a basis for evaluating the current results and for spotting trends.

There are many comparisons of outputs to inputs that would be potentially useful to the 09A as efficiency and productivity indicators. The output of the Acquisition Department can be expressed in construction WIP, earned SIOH and usable SIOH (the EFD percentage allocation of total SIOH). Inputs of resources include direct labor costs and hours, overhead labor costs and non-labor costs. Unfortunately, quantitative measures of output of all of the individual components of the department are not readily apparent at this time. The development of meaningful measures of product of, for example, the Project Management Office and the Contracts Division should be the subject of future research. A potentially useful product measure of the various field offices could be WIP discounted by a geographic factor. WIP accomplished appears to be somewhat relevent to the output of the Construction Division. It is recommended that research be undertaken to determine meaningful product measures for all of the major components of the acquisition department and to determine the most meaningful combinations of input versus output for the department and for the components. Upon the completion of the integration of the PMS and MADMAN data bases, the data will be available for automated generation of efficiency and productivity management ratios.

There remains considerable work to be done, however, in order to take full advantage of the management information potential of the new data structure.

b. Contract Change Order Analysis

In addition to quantitative efficiency and productivity evaluation, the subject of contract change order analysis also appears to be particularly relevent to the 09A's information requirements. Contract change orders result from some type of inadequacy of the original contract to provide the required finished product. The change could result from various foreseeable, unforeseeable, controllable and uncontrollable factors as well as combinations thereof. The impact of contract changes may or may not result in additional time and/or fee for the contractor but the most visible impact of contract changes is in the contract amount and in the contract completion date. An axiom of construction contracting is that a change order costs from 1½ to 2 times the amount of money that the item would have cost if it had been included in the original bid. Although this is not true for every specific case, it is nonetheless generally preferable to keep contract change orders to a minimum because of the inflated costs to the project for the change and because of the additional amounts of administrative expense incurred in processing the change order.

An analysis of the types of change orders processed and the reasons for the change orders is a potential valuable source of feedback management information for the 09A.

Of particular potential are construction contract change orders. The amount and types of these change orders are a reflection of the planning that preceeded the award of the contract. The percentage of design deficiency change orders reflects the competence of the designer and also of the design review performed in the Design Division. The percentage of customer-requested change orders could be an indicator of the thoroughness with which the customer's input was solicited during the design phase of the project. The percentage of change orders due to contractual "loop-holes" could reflect the adequacy of contract review. The ratio of in-house design deficiencies to Architect-Engineer firm design deficiencies could indicate the relative proficiency of either design media. NAVFAC-developed standards for all of these statistics could provide a basis for comparing a given Acquisition Department's performance against that of the other Acquisition Departments. It is the controllable change order statistics that are most relevent to the 09A and the analysis should reflect this fact.

Currently, the MADMAN data base and the CMS reporting system have the potential for performing a limited change order analysis at the EFD summarization level. As each contract change order is processed, one of four "Reason Codes" is attached to the change order and accumulated in the data base. The four reason codes include "unforeseen conditions", "project scope change", "design deficiency" and "time only".

A code soon to be added to the four is "accounting data change". At the present time, however, there is no use being made of these codes. Development effort is underway by FACSO to produce an automated version of the manual Contract Summary Report (see section IV.B.3. of this thesis for a description) and a limited change order analysis will be available as the result of this effort in that the number and dollar totals of each classification of change order for the period will be included in the output.

To become an effective management tool for the 09A, the change order impact must be summarized by more specific coding than is currently available. The design deficiencies, for example, must be able to be broken down by types such as inadequate site survey, mechanical design deficiency, specification deficiency and drawing error. Provision should be made for indicating the source of the design deficiency such as in-house or A/E firm. Customer-requested change orders should be identified as well as NAVFAC and major claimant scope changes. When the relevent change order classifications have been determined and the recording of them implemented, a change order analysis report should be generated for the use of the 09A and his key staff members with emphasis on controllable change orders. Eventually, standards or limits of tolerance for the change order statistics should be established by NAVFAC so that EFD variances may be reflected on the report.

The NAVFAC change order standards could become effective goals for the Command Management Plan of the future.

c. Project/Contract Closeout Analysis

Another potential area of management information for the 09A is in the analysis of project and contract closeout. Without some amount of continual emphasis on contract and project closeout, large backlogs of physically completed but not closed out contracts and (particularly) projects tend to accumulate. Also, specifically for construction contracts, the process between beneficial occupancy acceptance of the facility and contractor 100% completion is usually agonizingly long. It is to the advantage of the Acquisition Department to assure that projects and contracts are closed out in a timely and orderly manner to avoid "crash" programs of closing out dead and forgotten backlogs.

Although it would not have the amount of utility to the 09A that the previously discussed reports would have, a Project/Contract Closeout Analysis would be useful to the 09A in spotting and avoiding unfavorable closeout backlogs. Possible reporting criteria would include number of contracts above 90% completion, number of contracts not closed out within 90 days after beneficial occupancy, and number of open projects with completed contracts. The important considerations for the report would be to emphasize that portion of the open contracts and projects which was controllable by the EFD.

For example, the contracts and projects for which a contractor claim was unresolved would be out of the EFD's current closeout control. Printing prior period statistics such as last reporting period and current period last year along with the current period statistics would provide the 09A with basis of comparison information.

d. Bid Analysis

The final area of relevent management information to be discussed is that of construction contract bid analysis. Like the closeout analysis, the bid analysis would be of rather narrow use to the 09A but nonetheless would be potentially valuable to him. The purpose of analyzing the bids received on construction contracts is to test the accuracy of the cost estimating of the designer and to indicate cost trends in the construction environment. Conservative cost estimating by the designer will tend to result in a stringent interpretation of the project scope. The resulting design will be "bare bones" and the excess of funds available over the contract bid will tempt expensive change orders to recapture some of the niceties that had been avoided in the original design. "Loose" cost estimating, on the other hand, will tend to result in unsuccessful bid openings where the bids received are greater than the funds available. This results in either a loss of the project or in costly redesign and readvertising procedures.

It is important for the government estimate of a bid package to accurately reflect the bidding climate at the time of bid opening. Accurate estimating can avoid unsuccessful bid openings and wasteful change orders. To provide the 09A and his key staff members with feedback on estimating accuracy and bidding trends, bid analysis information should be generated. For each bid opening, the mean, mode and low bid should be recorded, along with the government estimate. On a periodic basis, say quarterly, the 09A should receive a statistical profile of the bids received for the period and for the year as compared to the government estimates. The information should also be generated for each estimating source to help spot individual source estimating problems. With this feedback information, measures could be taken to improve government estimate accuracy.

VI. CONCLUSIONS AND RECOMMENDATIONS

Thus far, this thesis has presented background information on the organization and functions of NAVFAC, the EFDs and the Acquisition Departments. It has described the investigational procedures employed by the writer to obtain data on which to base the thesis. It has described the information requirements common to all of the 09As, the systems available to produce the information required and how the 09As are currently using those systems. The thesis has characterized the management style currently employed by the 09As as highly intuitive with heavy reliance upon the manual, labor intensive reporting systems and little reliance upon the automated systems and quantitative management factors. The thesis has presented an argument for increasing the emphasis upon quantitative management techniques and analysis in the future, has described some data base changes, currently underway, that will make this possible and has recommended some data base changes that will provide the automated systems with the potential to perform a more sophisticated level of management analysis. Three automated management reports for the use of the 09As and others have been proposed and the management analysis possibilities of several other areas of information that are potentially available for management analysis have been pointed out.

Although the focus of the thesis has been upon the Acquisition Department Heads and their information needs, several points have been presented that are generally applicable to the entire NAVFAC system. First because of increasing complexity of workload and decreasing human assets with which to perform the work, increased use of automated reporting and analysis is the trend for the future. Second, in order to make full use of the available data bases and computing capability, a significant effort must be undertaken at all levels of the NAVFAC organization to employ operations analysis and systems analysis techniques to develop relevent quantitative management criteria. Third, top level support and user level participation are essential in the development, implementation and operation of the automated reporting systems of the future and must be obtained. Fourth, the efforts of developing relevent management factors, designing management oriented automated reports and developing the NAVFAC Command Management Plan must be fully coordinated and integrated for the purpose of creating a total NAVFAC management system. The first point is an observation. The latter three are the writer's strong recommendations.

Another observation made during the course of researching and writing this thesis is the significant degree of impact of the NAVFAC Command Management Plan (CMP) upon the operations of the Acquisition Departments.

Even those Acquisition Departments which considered the majority of the elements of the Command Management Plan to be unrealistic and useless were willing to "play the game" to help meet the goals. (This attitude was not universal. Several of the Acquisition Departments considered the goals to be useful management tools and used them as such). The acceptance and use of the Command Management Plan indicates the tremendous potential that the plan has as a management tool. Through proper design of the goals, the CMP could be extremely effective in evaluating the efficiency and effectiveness of the NAVFAC primary field activities and their organizational divisions, in evaluating the quality of individual managers' performance and in motivating the individual managers to operate their organizations in a manner consistent with the basic NAVFAC goals. This thesis has recommended developing relevent quantitative management factors, establishing the standards for these factors and defining the acceptable limits of variance from these standards. Utilization of these standards as CMP goals would be a valuable management contribution to the Command Management Plan. It is strongly recommended that NAVFAC consider funding a research effort with the task of strengthening the Command Management Plan and thus making better use of the management potential of this tool. The return on this investment promises to be very significant.

The final recommendation of this thesis is in the form of suggested topics for future thesis research. The basic investigational technique employed by this writer is generally applicable in studying the information requirements of any manager. The thesis student needs only to pick the manager in an area of his interest. Within the Acquisition Department, the information requirements of the individual key staff members are prime topics. At a higher level, the information requirements of an EFD Commander/Commanding Officer would be interesting. The development of some of the areas of management information discussed previously in the thesis, such as change order analysis, into a useful management tool would be a worthwhile challenge. Any of these topics would present to a Civil Engineer Corps officer student the opportunity to gain a better personal understanding of the system in which he works plus make recommendations which could potentially improve the flow of management information within that system.

APPENDIX A

KEY PERSON INTERVIEWED

Mr. F.R. Caldwell, CHESDIV, Director, Design Division

Mr. J.R. Collins, WESTDIV, Project Management Officer

CDR. W.F. Daniel, NORTHDIV, Head, Acquisition Department

Mr. J.M. Davis, LANTDIV, Director, Design Division

CDR. J.I. Dick-Peddie, WESTDIV, Head, Acquisition Department

LCDR. S.D. Frankum, NORTHDIV, Acquisition Coordination Officer

LT. J.P. Franz, SOUTHDIV, Acquisition Coordination Officer

Mr. M.P. Galgano, NAVFAC, Program Coordination Office

CDR. G.R. Gilmore, WESTDIV, Assistant Head, Acquisition Department

Mr. K. Godfrey, LANTDIV, Project Management Officer

Mr. C. Goodwin, LANTDIV, Director, Construction Division

Mr. R.A. Hackley, CHESDIV, Project Management Officer

Mr. E.L. Hughes, WESTDIV, Director, Construction Division

CDR. F.G. Kelley, SOUTHDIV, Head, Acquisition Department

Mr. E.G. Malone, SOUTHDIV, Director, Design Division

Mr. L.A. Martin, WESTDIV, Director, Contract Division

Mr. R.B. Masino, NORTHDIV, Director, Design Division

Mr. C.T. McConaghy, NORTHDIV, Project Management Officer

Mr. H.M. McCracken, SOUTHDIV, Project Management Officer

Mr. J. Miolla, LANTDIV, Director, Contract Division

CDR. F.M. Newcomb, CHESDIV, Head, Acquisition Department

Mr. T.E. Page, SOUTHDIV, Director, Contract Division

LCDR. F. Peechatka, LANTDIV, Acquisition Coordination Officer

Mr. N.W. Sheppard, SOUTHDIV, Director, Construction Division

Mr. J. Susha, FACSO, Computer Specialist

CAPT. R.M. Sutley, NAVFAC, Director of Programs & Comptroller

Mrs. L.M. Walker, WESTDIV, Program Analyst

Mr. R.J. Walsh, CHESDIV, Director, Construction Division

Mr. D.M. Wells, FACSO, Program Analysis Officer

CDR. R.B. Wilson, LANTDIV, Head, Acquisition Department

Mr. R. Wolf, WESTDIV, Director, Design Division

	Naval Facilities Engineering Command
	Navy Family Housing
IV	Northern Division, Naval Facilities Engineering Command
	Operations and Maintainance, Navy
	Pacific Division, Naval Facilities Engineering Command
	Project Status Report
	Resources Management System
	Resident Officer in Charge of Construction
	Supervision, Inspection and Overhead
IV	Southern Division, Naval Facilities Engineering Command
V	Western Division, Naval Facilities Engineering Command
	Work-in-Place
	Head, Acquisition Department
	Acquisition Coordination Officer
	Project Management Officer
	Director, Contract Division
	Director, Design Division
	Director, Construction Division

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